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FERDINANDSEN (C.). **Rhabdocline pseudotsugae paavist i Danmark.** [*Rhabdocline pseudotsugae* detected in Denmark.]—*Dansk Skovforen. Tidsskr., 1930*, 7, pp. 252–253, 1930.

Douglas firs [*Pseudotsuga taxifolia*] in various parts of Denmark have been found to show the typical symptoms [which are briefly described] of infection by *Rhabdocline pseudotsugae* [see preceding abstract].

BAXTER (D. V.). **A brush treatment of moldy staves.**—*Phytopath.*, xx, 7, pp. 575–582, 4 figs., 1930.

The damage caused by mouldiness of staves in the timber mills of the southern and south-central parts of the United States is estimated to cause an annual loss of thousands of dollars. Red gum [*Liquidambar styraciflua*], white elm [*Ulmus americana*], sycamore [? *Platanus* sp.], and hackberry [*Celtis occidentalis*] are most liable to the condition, which is associated with *Graphium*, *Aspergillus*, *Cladosporium*, and *Penicillium* spp. in south-eastern Missouri. A brief description is given of a simple machine fitted with steel brushes whereby this defect can be partially or entirely remedied at the moderate expense of 40 cents per thousand staves.

COOK (W. R. I.) & SCHWARTZ (E. J.). **The life-history, cytology, and method of infection of Plasmodiophora brassicae Woron., the cause of finger-and-toe disease of Cabbages and other crucifers.**—*Phil. Trans. Roy. Soc. London*, Ser. B., ccxviii, B455, pp. 283–314, 3 pl., 1 fig., 1930.

This is a detailed account of the authors' study of the life-history of *Plasmodiophora brassicae* in the tissues of cruciferous plants, and also of cytological studies which in all essential features confirmed the findings of previous workers. The investigation of the early stages of infection on very young cabbage seedlings tended to show that the swarm spores that are liberated from the spores of the organism set free into the soil on the decay of infected tissues only penetrate the root hairs, in which each swarm spore forms a small plasmodium containing up to 30 nuclei. Each nucleus then becomes surrounded by a mass of cytoplasm around which a wall develops, the contained nucleus dividing to form a zoosporangium. The latter produces several (up to four or sometimes six) zoospores (gametes), much smaller than the swarm spores. From the root hairs the zoospores migrate to the epidermal and cortical cells of the root and pass into the root tip. In these tissues they fuse in pairs and the resulting zygotes give rise to the plasmodia ordinarily visible in diseased roots. The plasmodia that give rise to the zoospores develop very rapidly and soon disappear on the death of the root hair. The fusion of the zoospores in a large measure accounts for the reduction division during spore formation which was noticed by former investigators and was also observed by the authors. No fusion of the swarm spores was observed.

A preliminary investigation of the histological changes caused by the organism in diseased roots substantiated the conclusions reached by Kunkel. The fungus was most commonly present in the medullary ray tissue of the young roots, which it tended to

increase both in size and development. There was no evidence that bacteria play any significant part either in the life-history of *P. brassicae* or in the infection process [cf. *R.A.M.*, viii, p. 747].

A review is given of all the so-called species of *Plasmodiophora* that have been recorded in the literature, of which only *P. brassicae* and *P. ficus-repentis* [ibid., vi, p. 8] are considered as correctly placed in it. Revised diagnoses of these two species are appended.

WALKER (J. C.) & SMITH (ROSE). **Effect of environmental factors upon the resistance of Cabbage to yellows.**—*Journ. Agric. Res.*, xli, 1, pp. 1–15, 3 figs., 1930.

Studies were conducted at Wisconsin University to determine the effect of environmental factors on the reaction of various strains of cabbage to yellows (*Fusarium conglutinans*) [*R.A.M.*, ix, p. 694]. The results of the investigations are fully discussed and tabulated. The hosts used in the tests consisted of homozygous-resistant and homozygous-susceptible progenies, mass-selected resistant varieties in commercial use (Wisconsin Hollander, Wisconsin All Seasons, and All Head Select), and commercial susceptible varieties (Copenhagen Market and Danish Ballhead).

In the susceptible strains and mass-selected resistant varieties grown in naturally infected soil the typical disease symptoms appeared in increasing percentages with rises in the soil temperature up to about 28° C., and were somewhat retarded at 33°. In homozygous-resistant strains there was no evidence of disease up to 24°, but it appeared in a mild form in a few cases at 26°, while at higher temperatures atypical symptoms developed. The reaction of the homozygous-resistant lines to yellows was, therefore, quite distinct from that of the susceptible and mass-selected types.

The increase of inoculum secured by steam sterilization of the soil and reinoculation with a pure culture of *F. conglutinans* resulted in more uniform infection and more rapid disease development in the susceptible and mass-selected types, but failed to alter appreciably the reaction of the homozygous-resistant lines. An increase in air temperature up to 28° accelerated the development of disease, and so did severe pruning of the root system during the transplanting process in susceptible plants.

Heterozygous plants from crosses between resistant and susceptible parents reacted as homozygous-resistant except in the manifestation of atypical high temperature symptoms at a slightly lower temperature. At soil temperatures of approximately 22° to 24°, transplants of F_2 segregating progenies from resistant-susceptible crosses showed some 25 per cent. of typical susceptible plants, as they had previously done in the field. With increases in temperature above this point the atypical high temperature symptoms appeared, as was to be anticipated, in the heterozygous- and homozygous-resistant members of the population.

SMITH (ROSE) & WALKER (J. C.). **A cytological study of Cabbage plants in strains susceptible or resistant to yellows.**—*Journ. Agric. Res.*, xli, 1, pp. 17–35, 3 pl., 6 figs., 1930.

Fusarium conglutinans, the causal organism of cabbage yellows

[see preceding abstract], was found to enter the root of the host through the intercellular spaces of the root cap and just behind the latter. Occasionally the fungus enters an epidermal cell in the meristematic regions directly. The points of emergence of the lateral roots from the main root also sometimes serve to admit the parasite. Injured roots can be entered through both the meristematic and permanent tissue. The progress of the fungus through the root is largely restricted to the xylem, which is usually entered from the apical meristem.

F. conglutinans readily penetrates the roots of homozygous-susceptible cabbage seedlings grown at 24° C. on inoculated soil-extract agar, whereas it seldom invades homozygous-resistant strains under the same conditions. Homozygous-susceptible cabbage seedlings, one month old or more, grown on inoculated soil at temperatures of 20° to 30°, are practically a total failure. Homozygous-resistant seedlings of the same age, grown under comparable conditions, are almost completely resistant up to 24° to 26°. At 28° and 30° the pathogen is largely confined to the root but it may occasionally extend into the aerial portion and cause the death of the host.

Resistance to yellows in strains of cabbage which have proved to be homozygous for this character occurs throughout the embryonic and permanent tissues. A comparison of susceptible-homozygous and resistant-homozygous cabbage strains gave no indication of an association between resistance and morphological characters, visible differences in wall composition, suberization, gum-like or other perceptible wall-occluding substances or growths, and volatile substances. All the available evidence suggests that resistance in actively growing tips must be almost exclusively linked with the protoplasm and attributable to antagonistic chemical substances or physiological qualities.

HIGGINS (B. B.). **'Halo spot' of Beans and Kudzu.**—*Georgia Exper. Stat. Bull.* 161, 21 pp., 5 figs., 1930.

Details are given of inoculation experiments and cultural studies in 1929, which confirmed the conclusion previously arrived at by Miss Hedges that the halo spot disease of bean [*Phaseolus vulgaris*] and a similar disease of kudzu (*Pueraria thunbergiana*) [*P. hirsuta*] are caused by the same organism, namely, *Bacterium medicaginis* var. *phaseolicola* [*R.A.M.*, ix, p. 424]. Examination of diseased kudzu plants in Georgia established the fact that the causal organism overwinters in cankers on the living vines, and there was ample evidence that from such centres in the spring the infection is spread to neighbouring bean fields by spattering rain drops. Field observations showed, however, that the most important source of infection is diseased bean seeds. In the light of the information thus obtained, the control measures recommended are the use of seed beans certified to be free from disease, and the avoidance of planting beans in the vicinity of kudzu plants.

Resistance tests of ten of the more popular string bean varieties showed that they varied considerably in susceptibility, from high resistance in the Refugee 1000–1 variety to extreme susceptibility in the Bountiful variety. It is thought probable that disease-free

seed could be obtained by growing beans during late summer in regions with dry summer weather, such as, for instance, the Piedmont section of Georgia.

Zaumeyer (W. J.). **The bacterial blight of Beans caused by Bacterium phaseoli.**—*U. S. Dept. of Agric. Tech. Bull.* 186, 36 pp., 2 pl., 10 figs., 1930.

This is a detailed account of the author's continued study of certain phases in the life-history of *Bacterium phaseoli* [*R.A.M.*, ix, p. 695], with particular reference to its relationship to the host. Artificial inoculation experiments indicated that infection is markedly influenced by moisture, since plants placed in a saturated atmosphere under proper temperature and light conditions showed a high percentage of infection, while under drier conditions infection was very slight. Field observations gave evidence that local dissemination of the parasite is brought about by atmospheric and irrigation waters, hail, wind, insects, and by débris of bean plants ploughed under. It was also shown that the practice of inoculating seed beans with water suspensions of *Bacillus radicicola* greatly contributes to the spread of the disease by seed, since the presence of a few infected beans is sufficient to contaminate the whole lot treated.

Histological examination of infected seedlings showed that the parasite invades the leaves through the stomata, from which it passes along the intercellular spaces, causing a gradual dissolution of the middle lamella. Later, bacterial pockets are formed owing to the disintegration of the cells and the bacteria reach the xylem vessels probably by penetrating into their finer, still undifferentiated, terminal ramifications in the leaf, which were found to be readily attacked and disintegrated. The stem is infected through the stomata of the hypocotyl and epicotyl, through the vascular elements leading from the leaf to the stem, or from infected cotyledons. When the bacteria reach the xylem vessels they may cause a wilting of the whole plant either by plugging the vessels or by the disintegration of the cell walls. The secondary xylem is seldom attacked, owing to the composition of its cell walls. Seed infection [the details of which have already been noticed: loc. cit.] also occurs. The results of microchemical tests of germinating beans indicated that after germination a large proportion of the cotyledonary tissue becomes disintegrated as a result of solution of its cellulose elements, and it is believed that the renewal of the parasitic activity of the bacteria is greatly influenced by the solubility of this material in the bacterial enzymes after germination has commenced.

Field observations during three years showed that no variety tested was entirely resistant to bacterial blight; however, a high degree of resistance was exhibited by four varieties of the Refugee type, and medium resistance by 19 [named] varieties.

Magee (C. J.). **Bacterial blight of Beans.**—*Agric. Gaz. New South Wales*, xli, 7, pp. 529–531, 2 figs., 1930.

This is a brief, popular account of bacterial blight (*Bacterium phaseoli*) [see preceding abstract] of beans, and of the losses which

it causes to the crop. It is followed by the usual recommendations for control of the disease, consisting in the use of clean seed, crop rotation, and strict sanitation of the fields.

REICHERT (I.). **Urophlyctis on Beet.**—Reprinted from *Yedeoth*, ii, 3–4, 5 pp., 3 figs., 1930. [Hebrew, with English summary.]

For several years sporadic outbreaks of wart galls caused by *Urophlyctis pulposa* Schroet. have been observed on beets in Palestine, and during 1930 a serious case of infection (20 to 30 per cent.) was observed on stock beets in the Valley of Esdraelon. The galls, composed of several small warts, hard and greenish-yellow when young, later becoming soft and watery brown with brownish-violet dots, generally range from 2 to 3 by 0·25 to 2 cm. but may reach a diameter of 15 cm. and cover the whole side of the beet, to which they are attached by a small stalk near the insertion of the leaves. The leaves and petioles of sugar beets were also found to be attacked. The warts enclose numerous communicating cavities containing the resting sporangia of the fungus.

HIURA (M.). **Studies on some downy mildews of agricultural plants. IV. On the downy mildew of Welsh Onion (Report I.).**—Reprinted from *Byochu-gai Zasshi, April, 1930*, 10 pp., 1930. [Japanese, with English summary.]

In the vicinity of Gifu, Japan, downy mildew [*Peronospora schleideni*] appears on Welsh onion early in March, if the weather is favourable, becomes prevalent during the next month or so, and declines towards the end of May. It reappears at the end of October, increases in November, and declines again in the middle of December. Conidial production is favoured by humid, but not by very wet, weather.

During May and June oospores are abundantly produced in the tissues, and occasionally in the flower stalks and capsules of diseased shoots. The hyphae survive the hot season within the host, causing primary infection in autumn; an inoculation experiment indicated that the oospores may cause primary infection. In winter *P. schleideni* hibernates as hyphae in the host.

Numerous observations made during the spring of 1928 on inflorescences from diseased shoots showed that abundant hyphae were present within the tissues of the flower stalks, perianths, styles, ovaries, filaments, and anthers; some of the inflorescences withered before producing flowers. The few seeds obtained were sown late in August and remained under observation until the following spring, but no infection was noted; the same result was obtained in a further similar test.

SPRAGUE (R.). **Notes on Phyllosticta rabiei on Chick Pea.**—*Phytopath.*, xx, 7, pp. 591–593, 1930.

Following the same general lines as those adopted in his recent study on the *Ascochyta* diseases of legumes [*R.A.M.*, ix, p. 273], the writer ascertained, through the examination of material and cultures supplied by Dr. D. Atanasoff from Bulgaria, that the common disease of chick pea (*Cicer arietinum*), caused by *Phyllo-*

sticta rabiei (Pass.) Trotter [ibid., ix, p. 697], is distinct from any *Ascochyta* on legumes.

About 5 per cent. of the total number of spores in the French and Italian collections and inoculated plants examined were found to be bicellular by means of a faint septum.

A comparison of the mature aerial lesions produced on legumes by *P. rabiei*, *Mycosphaerella pinodes*, and *A. pisi* is given in a table. *P. rabiei* forms mottled brown to deep tan lesions, with two to three wide concentric bands and vague to prominent red margins; the pycnidia are very obscure. The lesions produced by *M. pinodes* are dark brown, with numerous zonations, ill-defined margins, and obscure pycnidia. *A. pisi* forms pale tan, non-zonate lesions with prominent red-brown margins and conspicuous pycnidia.

The cultural characters of *P. rabiei*, *A. pisi*, and *M. pinodes* [which are briefly described] differ in important particulars.

Young garden pea, *Vicia villosa*, *Lathyrus odoratus*, *Dolichos lablab*, *Lens ervum*, and bean (*Phaseolus vulgaris*) plants sprayed with aqueous spore suspensions of *P. rabiei* showed no infection, but chick peas similarly inoculated were practically destroyed within a very short time. Pycnidia developed in great profusion. This virulent blighting is of the same type as that occurring in Europe, where it has been long known. Doubtful results were given by the inoculation of chick peas with *A. pisi* and *M. pinodes*. The latter fungus, however, was shown in the writer's previous investigations to be capable of causing severe foot rot of chick peas.

In its morphological and pathogenic characters *P. rabiei* somewhat resembles *M. pinodes*. The two fungi differ, however, in their incubation periods, degree of virulence on the aerial parts of the hosts, nature of symptoms, cultural characters, the absence of a perfect stage, and the almost complete lack of septation in the spores of *P. rabiei*. The position of the chick pea fungus in the genus *Phyllosticta* is held by the writer to be somewhat less definite than was assumed by Trotter. Both are agreed, however, as to the possibility of a past genetic connexion with *Ascochyta*. It is apparent that the chick pea disease caused by *P. rabiei* must be treated as a problem distinct from that of infection by *A. pisi* and *M. pinodes*.

GREEN (D. E.). **Diseases in the Mushroom bed.**—*Gard. Chron.*, lxxxvii, 2270, pp. 516–517, 3 figs., 1930.

Popular notes are given on the occurrence and control of two fungous diseases of cultivated mushrooms caused, respectively, by *Mycogone perniciosa* [*R.A.M.*, viii, pp. 90, 288; ix, p. 429] and *Xylaria vaporaria*. The latter organism grows through the compost of the bed and competes with the mushroom for nourishment. When the food supply is becoming exhausted the fungus forms sclerotia of varying shape and size (one specimen examined measured about 4 × 1·5 inches), composed of a tightly packed mass of hyphae full of nutriment. Unless promptly removed these bodies send up stalked fructifications bearing spores which disseminate the fungus.

Faes (H.) & Staehelin (M.). **La lutte contre les parasites de la Vigne, insectes et champignons, en 1929.** [The control of insect and fungous parasites of the Vine in 1929.]—*Annuaire Agric. de la Suisse*, xxxi, 2, pp. 123–133, 1930.

The results [which are tabulated and discussed] of tests conducted in 1929 at the Lausanne Viticultural Experiment Station indicated that the best control of downy mildew of the vine [*Plasmopara viticola*] is given by a slightly alkaline Bordeaux mixture (2 per cent.), with or without the addition of a spreader such as caseinated lime, skim milk, adhésol, and the like [*R.A.M.*, viii, p. 482]. Excessively alkaline mixtures should be avoided as they are liable to cause russeting of the leaves by destroying the protective cuticle.

The causal organism of coitre (*Coniothyrium diplodiella*) [ibid., ix, p. 225] was found to retain its germinative capacity and virulence for at least ten years.

Ravaz (L.). **Chronique. Le mildiou.** [Current events. Mildew.] —*Prog. Agric. et Vitic.*, xciii, 25, pp. 586–588, 1930.

Continuing his notes on the seasonal development of vine mildew [*Plasmopara viticola*] in the south of France [*R.A.M.*, ix, p. 761], the author states that the numerous thunderstorms which occurred at the beginning of June, 1930, caused a heavy attack by the fungus, especially in carelessly treated vineyards. These outbreaks were characterized by the appearance of conidial efflorescences on the immature shoots and young racemes, all the parts of which were affected. These abundant sources of infection call for increased vigilance on the part of the vine-growers, and for repeated applications of fungicidal sprays and dusts at intervals of not over seven days. A considerable improvement in the spraying apparatus now generally used in France is considered to be desirable.

Ravaz (L.). **Chronique. L'anthracnose sur les producteurs directs.** [Current events. Anthracnose on non-grafted Vines.] —*Prog. Agric. et Vitic.*, xciii, 27, pp. 6–7, 1930.

In referring to an outbreak in 1930 of anthracnose [*Gloeosporium ampelophagum*: *R.A.M.*, viii, p. 636] on non-grafted American vines in the Deux-Sèvres Department, the author states that experience at the Ecole d'Agriculture, Montpellier, has shown that many American vine varieties are very susceptible to the disease, especially in regions with a rainy climate, such as the west of France. The disease is easily amenable to copper sulphate treatments, for which reason it has been practically stamped out from vineyards exclusively planted with French vines (*Vitis vinifera*) which are regularly sprayed against mildew [*Plasmopara viticola*]. Vines affected with anthracnose should be treated before the bursting of the buds with a 35 to 40 per cent. iron sulphate solution, and later frequently sprayed with Bordeaux or Burgundy mixtures.

MARCHAL (P.) & FOËX (E.). **Rapport phytopathologique pour l'anneé 1929.** [Phytopathological report for the year 1929.] —*Ann. des Épiphyties*, xv, 6, pp. 317–373, 1929. [Received November, 1930.]

In this report, which is on the lines of those of previous years [*R.A.M.*, ix, p. 225], extensive notes are given on the more serious plant diseases observed in France during 1929, such as cereal foot rot (*Ophiobolus herpotrichus* and *Leptosphaeria herpotrichoides*) and rusts (*Puccinia* spp.), late blight (*Phytophthora infestans*) of the potato, *Oidium* (*Uncinula necator*) and downy mildew (*Plasmopara viticola*) of the vine, and others. It also gives an enumeration of the diseases encountered during the year on field crops, fruit and forest trees, and ornamental plants.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1929. [Summary reports on the work done in laboratories during 1929.]—*Ann. des Épiphyties*, xv, 6, pp. 374–403, 1929. [Received November, 1930.]

As in previous years [*R.A.M.*, ix, p. 226] these reports from the various phytopathological, entomological, and agricultural research stations in France give brief accounts of the work at each of them during 1929. The chief results of mycological interest have been noticed from time to time in this *Review*.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1929.** [Annual report for 1929 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Annuaire Agric. de la Suisse*, xxxi, 3, pp. 287–318, 1930.

In addition to various other items of phytopathological interest in connexion with vines and fruit trees, the statement is made that the damage caused to the former by coître (*Coniothyrium diplodiella*) [see above, p. 9] may be minimized by removing the wounded grapes within 48 hours after the fall of hail.

BEDNIAGIN (A. E.) & LOSHTSHILOVA (Mme A. P.). Грибные и бактериальные болезни полевых и огородных растений окрестностей г. Вятки, наблюдавшиеся летом **1928** г. [Fungal and bacterial diseases of field and garden crops observed during the summer of 1928 in the neighbourhood of the town of Vyatka.]—*Morbi Plantarum*, Leningrad, xviii, 4, pp. 201–217, 1929. [German summary. Received November, 1930.]

A list is given of 93 fungal and bacterial diseases of field and vegetable crops which were observed in 1928 in the neighbourhood of the town of Vyatka [eastern Russia], together with notes on their incidence and economic importance. The diseases are arranged by their hosts, and most of them are common, but the following may be mentioned. *Scolecotrichum graminis* [*R.A.M.*, vi, p. 275], *Ascochyta graminicola* [ibid., viii, p. 290], and *Typhula graminis* [*T. graminum*; ibid., ix, p. 709] attained an incidence of 30 to 50 per cent. on rye. Oats and barley were severely attacked by *Vermicularia relicina*, and barley by *Mycosphaerella tulasnei*. *Bacillus avenae* on oats and *Bacterium* [*B.*] *cerealium* on barley

attained in some localities an incidence of 100 per cent. Among vegetable crops the more important diseases were: *Phytophthora infestans* and *Cercospora concors* on potatoes; *Scolecotrichum melophthorum* [*Cladosporium cucumerinum*: ibid., vii, p. 6], *Sporodesmium mucosum* [ibid., vii, p. 7], *Fusarium* spp., and *Bacillus tracheiphilus* on cucumbers; and *Oidium lycopersici* on tomatoes [ibid., ii, p. 201].

EASTHAM (J. W.). **Report of Provincial Plant Pathologist, Vancouver.**—*Twenty-fourth Ann. Rept. Dept. of Agric. British Columbia for the year 1929*, pp. I 35–I 39, 1930.

Full details, accompanied by tables, are given of an attempt made in the Kootenays, British Columbia, to direct spraying operations for the control of apple scab (*Venturia inaequalis*) on the basis of personal observation of spore maturity and spore discharge and weather forecasts [*R.A.M.*, ix, pp. 320, 460, 532]. As far as can be judged by one season's work, it would seem that meteorological observations are of considerable value in fixing the time of the first spray to secure the most effective protection and in determining the dates of probable heavy infection. Generally speaking, however, there appears to be little hope of reducing the number of sprays without incurring undue risk. During the 1929 season spore discharge occurred more or less continuously over a period of 39 days, the most profuse liberation taking place about a month after the first discharge. Even with an absolutely reliable system of weather forecasting it would have been unwise to omit any of the four sprays recommended, and in actual fact very few of the showers falling on 16 out of the 39 days were predicted. It was found, moreover, that the spores were freely liberated by a rainfall of 0·02 inch, which may easily occur locally without being general over the entire area under observation.

Infectious chlorosis of roses [ibid., ix, pp. 385, 386] occurs chiefly in the region bordering the Pacific coast. Outdoor plants budded on *manetti* and *multiflora* stock are affected.

SMITH (F. E. V.). **Plant diseases in Jamaica in 1929. Report of the Government Microbiologist.**—*Ann. Rept. Dept. of Sci. and Agric. Jamaica for the year ended 31st December, 1929*, pp. 19–21, 1930.

During the period under review many new centres of Panama disease (*Fusarium cubense*) [see below, p. 43] appeared in the irrigated plains of St. Catherine and Vere, Jamaica. These foci are, however, widely scattered over all this irrigated belt, and up to the present the actual spread of the disease on individual properties has not been considerable.

Sugar-cane mosaic continues to give trouble on a few estates, but on the whole is kept well under control [*R.A.M.*, vii, p. 492].

Jamaica grapefruit and oranges examined in London showed very little rot and compared very favourably with citrus fruit from other countries. Blue and green moulds (*Penicillium italicum* and *P. digitatum*) were noticeably rare. This is largely attributed to improved handling and picking consequent on the enforcement of the Agricultural Produce Laws and Orders.

Plant pathology.—*Fiftieth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 39–44, 1929. [Received October, 1930.]

This report contains the following items of interest in addition to those noticed from other sources. Excellent control of raspberry anthracnose [*Plectodiscella veneta*] was given by a delayed dormant application of 1 in 20 concentrated lime-sulphur followed by a pre-blossom spray of 2½–4–50 Bordeaux mixture.

A reduction in the incidence of potato scab [*Actinomyces scabies*] was obtained by the addition of certain organic mercury compounds to the fertilizer, and by treating the seed with these preparations or with mercuric chloride. The average yield of 13 lots of certified potato seed of some 37 strains in south Jersey was 331·6 bushels per acre compared with 284·7 bushels for uncertified seed, and the percentages of disease (mostly leaf roll) were 0·93 and 35·4, respectively. Seed pieces infected with *Rhizoctonia* [*Corticium*] *solani* were planted at depths of 1, 2, and 4 inches. On the 1 inch plantings 48·5 per cent. of the sprouts were clean compared with 32·9 and 20·7 per cent. for the 2- and 4-inch plantings, respectively [cf. ibid., ix, p. 671].

The losses due to root rot of peas [*Aphanomyces euteiches*: ibid., ix, p. 354] were much reduced by heavy applications (1,000 lb. per acre) of a mixed fertilizer, the plot thus treated yielding 142 bushels per acre compared with only 75 where no fertilizer was applied.

Wilt of eggplants [*Verticillium albo-atrum*: ibid., viii, p. 23] was again found to be more destructive in neutral and acid soils than in those with higher P_H values.

Excellent control of damping-off of cucumber seedlings (*Pythium*) [*de Baryanum*: ibid., viii, p. 479] was given by dusting with copper carbonate and certain organic mercury compounds (especially the latter). On young seedlings the disease was partially controlled by spraying with Bordeaux mixture or dusting with copper-lime.

The causal organism of rhododendron wilt [*Phytophthora cinnamomi*: ibid., ix, p. 390] was found to grow best between 20° and 30° C., its development at 15° and below being poor. No growth occurs on solid media below P_H 4·5, but development is profuse between P_H 5 and 7·8. Good temporary protection against this fungus has been given by soil treatment with formaldehyde or sulphuric acid, but the efficacy of these substances does not persist till the end of the season. Organic mercury compounds, worked into the upper three inches of soil, materially reduce the losses from wilt, but the alkaline carrier of these preparations renders the soil unsuitable for the cultivation of the host.

[Richards (B. L.) & Wann (F. B.).] **Plant pathology and physiology.**—*Bienn. Rept. Utah Agric. Exper. Stat. July 1, 1928, to June 30, 1930* (*Bull.* 220), pp. 51–55, 3 figs., 1930.

Seven definite virus diseases of potatoes have been differentiated in Utah during the period under review, viz., rugose mosaic, mild mosaic, crinkle mosaic, leaf rolling mosaic, spindle tuber, leaf roll, witches' broom, and possibly a super-mild mosaic [*R.A.M.*, ix,

pp. 332, 401, 475, 481]. All these diseases are important factors in the reduction of yield. Plots maintained in five different counties have shown that the disturbances in question, especially rugose mosaic, spread much more rapidly in some areas than in others. It has been found that roguing by the tuber-unit method practically eliminates the virus diseases from the seed stock. Much evidence has been obtained that psyllid yellows of potatoes, associated with *Paratrioza cockerelli* [ibid., ix, p. 333], is due to a toxin injected during the feeding process of the insect rather than to a distinct virus.

Tomatoes in Utah suffer severely from the attacks of *Aplanobacter michiganense* [ibid., ix, p. 419], which was found in 59 out of 66 plantings inspected during the week from 26th August to 2nd September, 1929.

A survey of the Magna district during 1928–9 revealed the presence of bacterial wilt of lucerne [*A. insidiosum* : ibid., ix, p. 788] in 25 out of 28 fields, and in the Murray district in 13 out of 15 fields inspected, 4 of which showed 100 per cent. infection ; it also occurs in the Utah, Davis, Weber, and Cache counties.

Forty-third Annual Report of the Agricultural Experiment Station of Nebraska.—52 pp., 1930.

This report contains the following references of phytopathological interest in addition to those already noticed from other sources. During the past year studies of lucerne wilt [*Aplanobacter insidiosum*: see preceding abstract], including the pathological anatomy of the disease, selections for wilt resistance, and winter injury and hardiness, have been in progress mainly at Lincoln and in the Platte Valley.

No infected plants were found during the first season of observation (1927), indicating that one winter's growth is essential to the development of the disease. The bacteria enter the plant in at least two ways, either through winter injury wounds in the early spring, or through the stems at the time of mowing. The organism has been found throughout the length of the plant axis; it is primarily vascular, though the parenchyma and medullary rays may also be invaded. The water-conducting vessels are reached through cut stems or through cracks in the tissues produced by winter injuries. In the later stages of the disease the bacteria produce pockets in the parenchyma. With the breaking down of the outer bark these pockets are released.

Hot formaldehyde has consistently given the best results in the control of seed-borne potato scab [*Actinomyces scabies*: ibid., ix, p. 671], and was also effective against *Rhizoctonia* [*Corticium*] *solani* [ibid., ix, p. 404], though delaying emergence somewhat in this case. Mercuric chloride and other mercurial preparations gave good control of *C. solani* but not of scab. The former organism caused a reduction of yield, whereas the latter affected only the quality and not the quantity of the crop.

In a study of potato scab and *Fusarium* wilt [*F. eumartii* : ibid., p. 597] in relation to soil infection, the average incidence of the former over the entire commercial acreage of western Nebraska was 53·1 per cent., with 13·6 per cent. of the crop graded as scab

culls. The highest infection was 100 per cent., with 98 per cent. culls. Ninety-five per cent. of the fields were infected with *Fusarium* (average 4·2, maximum 55 per cent.). Over 30 per cent. of infection was found on one virgin soil, and most of the fields had not grown potatoes for more than four years. The data indicate that the important factor in the development of *Fusarium* wilt is the effect of other crops in the rotation rather than the length of time between the potato crops.

Very heavy damage was caused by cherry leaf spot (*Coccomyces hiemalis*) [ibid., ix, p. 394], against which spraying appears to be ineffectual. Severe yellowing and defoliation were observed. The perithecia of the fungus were found to mature as early as 25th April, and ascospore ejection occurred in the middle of May.

MILOVIDOV (P. F.). **Zur Zytologie der Pflanzentumoren.** [On the cytology of the plant tumours.]—*Protoplasma*, x, 2, pp. 294–296, 9 figs., 1930.

The examination of tumours (1 to 2½ months old) induced in *Pelargonium zonale* by inoculation with *Bacterium tumefaciens* [*R.A.M.*, ix, p. 660] revealed in various tissues, including those of the vascular bundles, large numbers of chondriosomes. Typical plastids were also of frequent occurrence in the tumour cells, and tannins were abundant. The latter are evidently the 'large light-coloured bodies with black granular centres' observed but not determined by Riker [ibid., vii, p. 144]. The chondriosomes of the tumour cells are considered to show no marked deviations from those of normal tissues.

VANTERPOOL (T. C.). **Asterocystis radicis in the roots of cereals in Saskatchewan.**—*Phytopath.*, xx, 8, pp. 677–680, 2 figs., 1930.

During a systematic examination of the root system of cereal seedlings grown in pots of soil from widely separated localities of Saskatchewan, the writer observed the frequent presence of the sporangia and hypnospores of *Asterocystis radicis* [*R.A.M.*, vi, p. 753; viii, p. 282] in the finer roots of oats, and their occasional occurrence in wheat, barley, and rye. The fungus was further found in the roots of maize, western rye grass (*Agropyron tenerum*), and field mustard (*Sinapis arvensis*) seedlings in potted soil, and in barley seedlings from the field. Only in oats was infection sometimes accompanied by necrosis of the roots and a slight yellow discoloration of the foliage. The most heavily infected soils were apparently those with the highest water-holding capacity.

Long exit tubes were often observed in the mature sporangia of *A. radicis* in oats, but less commonly in wheat. The sporangia and hypnospores were formed singly or in groups in the epidermal, root hair, and outermost cortical cells of the root. The hypnospores ranged from 8 to 40 μ in diameter, with an average of 18 μ, the sporangia being somewhat larger. The zoospores, which were occasionally seen in active motion in the host cells, were uniflagellate with a flagellum equal in length to about six times the spore diameter. Penetration of a root hair by a zoospore was observed,

and these bodies are also able to enter the epidermal cells of the root directly. Cells of the root cap are sometimes invaded.

It would appear that *A. radicis* is a normal inhabitant of Saskatchewan soils, which is probably maintained from year to year on the roots of various mustards, grasses, and cultivated cereals. No appreciable damage from this source need be anticipated except under unusually favourable conditions for the fungus.

STAKMAN (E. C.), LEVINE (M. N.), & COTTER (R. U.). **Origin of physiologic forms of Puccinia graminis through hybridization and mutation.**—*Scient. Agric.*, x, 11, pp. 707–720, 1930.

This is an extended account, accompanied by tables, of the writers' investigations on the development of physiological forms of *Puccinia graminis* through hybridization and mutation, a preliminary notice of which has already appeared [*R.A.M.*, ix, p. 365].

Eight distinct forms of *P. g. tritici* were obtained from a single aecidial cup resulting from the intermixture of the pycnidial nectar of *P. g. tritici* 36 × *P. g. agrostidis*. Three of these (67, 69, and 72) are new to science; another (58) was hitherto unknown in North America, though it had been found in Portugal; while form 61 is of very rare occurrence and had previously been isolated only from aecidial material in the field. Forms 10 and 52, also derived from the above-mentioned cross, are relatively infrequent and of limited distribution, while 38 is prevalent. None of these forms was capable of infecting *Agrostis alba*. Some of the forms differed in virulence from the *tritici* parent, one (72) being able to produce moderate infection on Khapli wheat, while in the case of 58 the uredospores were of three different colours, viz., mars yellow, argus brown, and dull auburn (Ridgway's Color Standards).

In a cross between *P. g. secalis* 11 and *P. g. tritici* 36, the *secalis* form 9 and the *tritici* form 57 were isolated from different aecidial cups. Prolific rye, which is intermediate in reaction to form 11, proved fairly susceptible to 9. *P. g. tritici* 57 was found to differ considerably from the parent 36, the former being unable to attack Kanred (a loss of virulence compared with 36), whereas it infects Vernal very heavily, indicating an acquisition of virulence in this respect; Kubanka wheat, moreover, is very susceptible to 57 but indeterminate to 36. In another cross between *P. g. secalis* 11 and *P. g. tritici* 36 the resultant forms were all of the *tritici* variety (21, 70, and 71). The two last-named, neither of which has ever been reported before, are considered to be of special interest as they evidently resulted from a genetic cross. Both were capable of attacking Little Club wheat, form 70 producing an indeterminate type of infection on Marquis and Vernal, while 71 also infects Marquis in the same way but cannot attack Vernal. All the other wheat differentials are highly resistant to, or immune from, both forms.

In a uredospore culture of *P. g. tritici* form 1, constant pathogenically for over 13 years, a new form (subsequently identified as 60) suddenly appeared. This form differs from 1 in a loss of

capacity to produce normal infection on either Kubanka or Einkorn. Two other mutants arising from form 1 (21 and 17) are much more virulent than the original culture. Recently yet another form, apparently quite distinct from all hitherto known in its parasitic behaviour, has split off from the original cultures; this has been designated as form 68.

NEWTON (MARGARET), JOHNSON (T.), & BROWN (A. M.). **A preliminary study on the hybridization of physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, x, 11, pp. 721–731, 1 fig., 3 diags., 1930.

This is a detailed account, accompanied by tables, of the writers' investigations on the hybridization of physiological forms of *Puccinia graminis tritici* [see preceding abstract], and of the selfing of individual forms, a preliminary note on which has already been published [*R.A.M.*, ix, p. 365].

Of eight selfed physiological forms (17, 9, 49, 21, 36, 36 greyish-brown mutant, 50, and 53), all except 9 segregated, 12 of the forms arising from this process being new and 18 already known. Form 9 was the only one which did not break up, all the rest being evidently heterozygous. Generally speaking, although several physiological forms arose in one pustule, only one was obtained from a single aecidial cup. Crosses were made between a number of the forms thus obtained, the nectar from monosporidial pustules of each of the parents being mixed. The result was the production of a single form in each case, though, as might be expected from the heterozygous nature of the material, different monosporidial pustules of a given parent might produce different forms when crossed with another parent. When a barberry plant was inoculated simultaneously with eight physiological forms, both mono- and multisporidial pustules developed. Seventy-three isolations were made from these aecidia, yielding 17 forms, of which seven were new. Further experiments showed that, of 276 aecidial cups cultured, 262 or 95 per cent. produced only one physiological form each, while the remaining 5 per cent. produced two or more each. The evidence indicates, therefore, that in the same aecidium the conjugate pair of nuclei of one aecidiospore is genetically identical with the conjugate pair of another. Assuming that one member of each conjugate pair of nuclei is of pycnosporic, and the other of hyphal origin, derived from the haploid hyphae giving rise to the aecidium, it would appear that all the conjugate nuclei of an aecidium are descended from two nuclei which had become associated in conjugate relationship. However, in the few instances of the recovery of more than one physiological form of the rust from a single aecidium, two or more genetically distinct conjugate pairs must be involved, unless the phenomenon be attributed to contamination during culturing—a possibility which cannot be entirely ignored.

ARRHENIUS (O.). **Berberis i Södertörn.** [*Berberis* in Södertörn.] —*Svensk Bot. Tidskr.*, xxiv, 2, pp. 319–321, 1 map, 1930.

On the basis of a systematic survey of the Stockholm province, the writer has prepared a map showing the distribution of *Berberis*

bushes in the Sotholm, Svartlösa, and Öknebo districts, with a view to assistance in the barberry eradication campaign [against *Puccinia graminis*: *R.A.M.*, ix, p. 98]. Attention is drawn to the remarkable frequency of the barberry along the watercourses from the south of Södertörn to Dalälven, the seeds being in all probability disseminated by birds.

JOHNSTON (C. O.). **An aberrant physiologic form of Puccinia triticina Eriks.**—*Phytopath.*, xx, 8, pp. 609–620, 1 fig., 1930.

Full details are given of an aberrant physiological form of leaf rust of wheat (*Puccinia triticina*) [*R.A.M.*, ix, p. 635] isolated from a highly resistant strain of Mediterranean wheat (Texas 3015–63) at Denton, Texas, in the spring of 1927 and herein described as culture 199.

Greenhouse experiments have shown that this form differs from all others studied at Manhattan, Kansas. The period from inoculation to flecking averages about three days longer, and that from inoculation to sporulation about seven days longer than for other known forms of *P. triticina*. The uredospores are of a paler orange and slightly smaller than those of other forms and the uredosori are also smaller. The results [which are tabulated and fully discussed] of differential variety inoculation tests indicate that the culture is a hitherto undescribed physiological form.

BODINE (E. W.) & DURRELL (L. W.). **Inoculation of Wheat with Tilletia levis (Kühn).**—*Phytopath.*, xx, 8, pp. 663–668, 2 figs., 1930.

The smut balls of twelve strains of *Tilletia levis* [*T. foetens*: *R.A.M.*, ix, p. 768] from widely separated parts of the United States were surface-sterilized with mercuric chloride (1 in 1,000) and the spores shaken on to plain agar in a Petri dish. After five days the colonies resulting from germinating spores were transferred to nutrient agar, kept at room temperature for two or three days to bring out possible contamination, and then at the more favourable temperature of 12° to 15° C. Particularly good growth was made on Thaxter's hard potato agar. Defiance wheat plants (236), heavily dusted with copper carbonate before planting in the greenhouse, were inoculated at different heights from $3\frac{1}{2}$ to 18 inches by hypodermic injection or by placing the small colonies inside the sheath, in each case the inoculation being made as near the nodes or the growing point as possible. The highest percentage of infection (9·8) was secured by inoculation at the height of $3\frac{1}{2}$ inches, the corresponding figures for 6, 8, 12, and 18 inches being 6, 8·7, 6·3, and 7·3 per cent., respectively. Approximately 50 per cent. of smut was obtained on a few 30-day-old plants, 12 inches tall, grown from sterilized seed on sterilized soil at 15°, which appears to be the optimum temperature for infection by *T. foetens*. The results at 20° to 25° were less satisfactory. In culture the fungus behaves similarly, a brown discoloration and the production of spores resembling smut spores taking place above 20°, while at 25° and 30° the mycelium disintegrates. Both in nature and in culture the cycle of *T. foetens* from germination to the production of brown spores occupies 50 to 70 days. The wheat tissue is apparently

susceptible to infection until the time of flowering, though infection occurs more readily on younger plants.

WOOLMAN (H. M.). **Infection phenomena and host reactions caused by Tilletia tritici in susceptible and nonsusceptible varieties of Wheat.**—*Phytopath.*, xx, 8, pp. 637–652, 7 figs., 1930.

From 1919 to 1923 the author conducted a series of investigations at Corvallis, Oregon, on the reaction of susceptible and resistant wheat varieties to infection by *Tilletia tritici* [*T. caries*]. The technique of the experiments is fully described and the results tabulated and discussed.

It was found that the process of infection can be divided into three phases. The first is marked by the entrance of the hypha into the epidermal cell and its development therein, at which stage it is Gram-negative and both inter- and intracellular. In the second phase the fungus develops in the deeper parts of the coleoptile and in the sheath tissues of the earliest true leaves. At this stage it is Gram-positive and both inter- and intracellular. During the third phase the organism develops in the very young leaf blades and in the nodes, internodes, and growing points of the plant, where it is Gram-positive and strictly intercellular.

The examination of 60 plants of Martin, 40 of Hussar, and 20 of Hybrid 143, the two first immune from *T. caries* and the third highly susceptible, showed that the fungus enters the epidermis of both types of seedling with equal facility. Numerous (up to 100) points of attack (75 per cent. of which were situated within 2·5 cm. above the seed from which the plant grew) were found in all plants examined at the age of seven days. In plants examined at the time of emergence only two or three such points per plant could be found. Infection evidently begins about this time under local conditions. In 25 per cent. of Hybrid 143 plants examined, at seven days, the second phase of infection was observed, whereas this phase was shown by only 5 per cent. of the Hussar and Martin plants examined up to twenty days. It would seem, therefore, that an inhibiting factor (possessed in some degree by even the most susceptible varieties) comes into action as soon as the hypha penetrates the lumen of an epidermal cell of the coleoptile.

The first indication of an attack on the epidermal cell wall, viewed in a longitudinal radial section, is a definite thickening of the wall for a distance of 20 μ or more. Seen in tangential section this swelling, which is apparently caused by the gelatinization of the portion of the wall lying between the cuticle and the plasma membrane, appears as a circular spot, sometimes exhibiting zonation. A little later a conical protuberance is seen on the inside of the wall just below the point of attack by the hypha, with the growth of which the protuberance first becomes more or less globular and finally an elongated sheath 8 to 12 μ in diameter, enclosing the hypha, 1 μ or less in diameter. The transition from the first to the second phase of infection is still obscure. The second phase, in which the hypha becomes Gram-positive, is very rarely found in the epidermal cells but frequently occurs in the second cell layer near the points of entrance. It seems reasonable to assume that the change from Gram-negative to Gram-positive,

coincides with the establishment of parasitic relations between the fungus and the host.

Heald (F. D.) & Gaines (E. F.). **The control of bunt or stinking smut of Wheat.**—*Washington Agric. Exper. Stat. Bull.* 241, 30 pp., 2 graphs, 1 map, 1930.

The problem of bunt control in Washington has been complicated in recent years by the appearance of *Tilletia levis* [*T. foetens*] throughout the wheat-growing districts of the Inland Empire, four physiological strains of this fungus and four of *T. tritici* [*T. caries*: see preceding abstracts] being known in the State. Marquis is the most resistant to these bunts of any of the commercial spring wheats, but considerable promise is also shown by various others, e. g., a cross between Baart and Ridit, Lutescens, a cross between Martin and Marquis, Hope, and Spring Alaska.

Of the three common seed-grain disinfectants for spring wheat, formaldehyde has given the highest percentage of perfect control, followed by copper sulphate and copper carbonate.

The control of bunt in winter wheat is complicated by the heavy soil contamination resulting from wind-blown spores which are generally present in the summer fallow fields at sowing time. In a series of 53 tests it was found that an average difference of 25·8 per cent. of smutted heads made a difference of 23 per cent. in yield, the conclusion being reached that the percentage of diseased heads is a fairly accurate indication of the actual loss to the farmer. The most promising resistant winter wheats are Turkey, Albit, and Ridit. Copper sulphate is much more effective than formaldehyde for the control of bunt in winter wheat, while copper carbonate and ceresan have also given satisfactory results. The highest incidence of infection occurs in seed sown between 15th September and early October at soil temperatures of 45° to 50° F., with a moderate moisture content [*R.A.M.*, ii, p. 13; iii, p. 512].

Pethybridge (G. H.) & Moore (W. C.). **'Dry pickling' or 'dusting' seed Wheat to prevent bunt: results of co-operative trials by Advisory Mycologists in England and Wales, 1927–28.**—*Journ. Min. Agric.*, xxxvii, 5, pp. 429–439, 1930.

This is a summary of co-operative trials which were conducted in 1927 and 1928 at various centres in England and Wales to test the comparative efficacy in the control of wheat bunt [*Tilletia caries* and *T. foetens*] of seed-grain disinfection (*a*) by steeping in copper sulphate solution, (*b*) in formalin solution, and (*c*) by dusting with copper carbonate dust.

The mean of the combined results for the two years showed that the percentages of bunted ears in the crops treated by these three methods were 0·28, 0·79, and 0·80, respectively, while for untreated crops the figure was 22·82. The average number of ears per plot worked out as follows: 2,520, 2,559, 3,057, and 2,919, respectively, for 1927, and 3,189, 3,412, 3,549, and 3,291, respectively, for 1928. The dry method therefore compares at least very favourably with the steeping processes both in respect of fungicidal efficiency and crop yield.

FERRARIS (T.). **La golpe bianca.** [White blight.]—*Rivista Agricola* xxvi, 587, pp. 233–234, 3 figs., 1930.

Brief notes are given on white blight of the culms of wheat, caused by *Fusarium roseum* Link, the conidial stage of *Gibberella saubinetii* [*R.A.M.*, ix, p. 642], which the author recently observed, especially on the Mentano and Ardito varieties, in Piedmont.

FERRARIS (T.). **Malattia del Grano di Sardegna.** [A disease of Wheat in Sardinia.]—*Rivista Agricola*, xxvi, 589, p. 286, 1930.

A brief account is given of a disease of wheat more or less endemic in a few localities in Sardinia. The affected plants are stunted and sickly, and the ears are small, flower badly, and mature only with difficulty. The culms turn yellow and the lower internodes wilt, showing the presence of diffuse, brownish spots, on which, under suitable conditions of humidity, appear reddish masses of 3- to 5-septate conidia of a *Fusarium*. A whitish mould forms between the sheaths and the culm, with yellowish, ovoid perithecia having an ostiole marked by bristles at the extremity. The asci are ovoid and contain lemon-shaped, olivaceous spores. In the affected tissues the mycelium is intra- and intercellular. The fungus is identified as *Sphaeroderma damnosum*.

MIÈGE (E.). **Le mouchetage des grains de Blé.** [The 'mouchetage' of Wheat grains.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 262–337, 2 pl., 2 graphs., 1930.

The author states that the condition of wheat grains known as black point in America [*R.A.M.*, iv, p. 407] and 'puntatura' in Italy [ibid., v, p. 663], and which he terms 'moucheture' or 'mouchetage', was first recorded in Morocco in 1922, since when it was found to occur rather widely in that country, its incidence and severity varying from year to year. The results of his investigation of the disease since 1922 in Morocco [details of which are given] showed that it is not in itself of considerable economic importance, since it does not affect the germination of the seed-grain or the quantity or quality of the yield, although the commercial value of grain affected with it is usually lowered to an extent out of proportion with the actual injury. Hard varieties of wheat appear to be more susceptible to mouchetage than soft ones, and it was also found to occur on other species of *Triticum*, e.g., *T. turgidum*, *T. sphaerococcum*, *T. dicoccum*, and *T. monococcum*. In Morocco it is apparently even more widespread on barley than on wheat.

The pathological side of the disease is not dealt with by the author, who simply gives an enumeration of the fungi implicated by other workers in America and Italy [see next abstract.]

ROSELLA (E.). **Quelques observations sur la moucheture des céréales.** [Some remarks concerning the 'moucheture' of cereals.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 338–344, 1 fig., 1930.

The examination of wheat grains affected with 'moucheture' [see preceding abstract] from Morocco revealed in the discoloured regions of the scutellum and the groove of the grain a fairly large,

septate, and brown mycelium developing in the teguments but never penetrating deeper. The hyphae passed from cell to cell through the wall pits. Affected wheat grains, after surface sterilization in a 2 per cent. solution of mercuric chloride in alcohol, invariably yielded species of *Alternaria* which grew well on ordinary media; in pure cultures of these fungi fructifications belonging to the genus *Pleospora* occasionally developed. The author believes that these species of *Alternaria* are the same as described by Italian authors under the names of *A. tenuis* and *A. peglionii* [*R.A.M.*, viii, p. 663]. It is stressed that in no case was any of the other organisms recorded by other workers on wheat grain diseases, e.g., *Cladosporium herbarum, Helminthosporium sativum, H. gramineum*, &c., found on the wheat studied by the author.

The same species of *Alternaria* were also isolated in the majority of cases from barley grains from Morocco affected with 'moucheture', which, however, also yielded in some cases another brown fungus which was not identified, and a species of *Sporomia*, which inoculation experiments showed to be a pure saprophyte incapable of infecting barley seedlings.

Details are given of tests which showed that while wheat and barley seed grains affected with 'moucheture' exhibited a reduced viability when germinated in Petri dishes, no such effect of the condition on the germinability of the grain was noticeable when the latter was sown in sand in pots. It was also noted that as a rule the grains affected with this condition are larger and heavier than normal ones, and crops grown from them are normal. The fact, however, that the discoloration of the grain renders it less acceptable to the trade is an inducement for measures to be taken for its control, hot water treatment of the seed grain for 10 minutes at 52° C. being considered well worth trying for this purpose.

ROSELLA (E.). **Sur une moucheture de l'Orge.** [Note on a form of 'moucheture' of Barley.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 345–348, 2 figs., 1930.

In giving a brief account of a severe epidemic of *Helminthosporium gramineum* [*R.A.M.*, ix, p. 710] on wheat and especially on barley in France in 1930, the author states that on the latter host the outbreak was marked by an exceptionally heavy infection of the ears which, in random samples, showed the presence in them of 58 per cent. of shrivelled and dried grains, besides a large number of grains partially or totally discoloured on the surface by the fungus, but otherwise normal. The infection of the ears occurred while they were still inside the sheaths, the indications being that the fungus had penetrated from the outside of the latter. In some cases the stems bearing the ears appeared to have been attacked first, this leading to the partial or total desiccation of the ears. The infection of the grain occurred either from the rachis, in which case a discoloration of the scutellum ensued, resembling the condition known as 'moucheture' [see preceding abstracts], or directly, when the discoloration involved the apical end of the grain, chiefly the surface adjacent to the inferior glume.

When sown in hanging drops the spores from the leaves and

grains rapidly germinated by lateral or terminal germ-tubes and produced a hyaline, branched mycelium devoid of appressoria. A similar mycelium was also obtained from the hyphae growing in the leaves; this mycelium preserved its white colour and remained sterile on all the media tested. In no case was the perfect stage of the fungus found in the cultures, which only formed a kind of undifferentiated sclerotia. Germination tests of discoloured but not shrivelled grains showed that their viability was not depressed by this condition, but this result needs further confirmation, as it is believed that the drastic surface disinfection to which such grains were subjected may have killed the fungus inside the teguments of the grains.

A brief reference is made to experiments by other workers in the control of the disease by disinfecting the seed with organic mercury preparations, e.g., by steeping it for 12 to 24 hours in a 1 in 800 solution of uspulun at 10° C.

KARNS (G. M.). **Effectiveness of iodine in the control of smut on Oats.**—*Indus. & Engin. Chem.*, xxii, 8, p. 864, 1930.

With a view to enhancing the efficacy of Sayre's iodine treatment for the control of smuts on oats [*Ustilago avenae* and *U. kolleri*: *R.A.M.*, vii, p. 159], the writer devised a method whereby the iodine was brought into contact with the smutted seed-grain without the aid of Fuller's earth, the adsorptive tendency of which was considered to detract slightly from the value of the compound.

Seed-grain infected with both smuts was placed in a large bottle and the desired amount of a 10 per cent. solution of iodine in carbon disulphide added. After five minutes' rotation of the bottle end over end, during which time the iodine volatilized sufficiently to give a deep purple colour, the solvent had vaporized, leaving the seed-grain in a fit state to pass through a drill. The treated grain was then placed in paper bags and left for 48 hours. The amount of iodine used in the treatments ranged from 0·07 to 1 oz. per bushel. One sample was left untreated as a control and another received the standard treatment of 3 oz. per bushel of an ethyl mercuric chloride dust.

Even in the untreated samples the incidence of smut was only about 1 per cent., the corresponding figure for the treatments with 0·5 oz. iodine per bushel and the dust being 0·3 per cent. and that for 1 oz. iodine per bushel only 0·04 per cent.

These results are considered sufficiently promising to justify further investigations. The method of applying the treatment is stated to be adapted to any solid disinfecting agent soluble in an appropriate solvent.

BONDARTZEFF (A. S.). **Учет спорыньи Ржи на Моршанском опытном поле и в его окрестностях в 1929 г.** [Determination of the contamination of Rye with ergot on the Morshansk Experimental Field and in its vicinity in 1929.]—*Morbi Plantarum*, Leningrad, xviii, 4, pp. 231–234, 1929. [German summary. Received November, 1930.]

The author states that during the summer of 1929 ergot [*Clavi-*

ceps purpurea] was widespread in rye fields in the district of Morshansk [central Russia]. An estimation of the incidence of the disease in the field by Kossobutzky's method [*R.A.M.*, ix, p. 103] showed it to be from 0.52 to 0·92 per cent. of the unharvested grain, while the analysis of threshed rye showed a contamination of the grain ranging from 0·30 to 0·42 per cent. by weight, this confirming to a great extent Kossobutzky's statement that at least one half of the sclerotia infecting the ears in the field are lost during the harvest and afterwards. In some cases, however, the contamination of the threshed grain was greater than expected from the field survey, but this was found to be due to a strong admixture of ergot sclerotia from couch grass [*Agropyron repens*], the infection of which with *C. purpurea* ranged that year from 50 to 60 per cent. The contamination of the threshed rye grain was reduced by about one half (to 0·18 to 0·22 per cent.) by passing the grain through rotatory sieves.

MENDIOLA (VICTORIA B.). **The Fusarium disease of Corn.**—*Philipp. Agric.*, xix, 2, pp. 79–106, 2 pl., 1 fig., 1930.

A full account is given of the symptoms, distribution, and other features of the *Fusarium* disease of maize, with observations on the morphology, cultural characters, and taxonomy of the causal organism (*Fusarium moniliforme*) [*Gibberella moniliformis*: *R.A.M.*, ix, p. 374].

The disease was first reported from the Philippines in 1918. The most conspicuous symptoms are yellowing and wilting of the leaves and decay of the roots, resulting in the death of the seedlings. On the ears the disease is characterized by the production of stripes on the grain and the cracking or blasting of the kernels, causing typical rotting of the kernels and discoloration of the seed coats.

The writer's observations and experiments have shown that the sources of primary infection are the soil and diseased seeds. The ears become infected through the silk. The fungus is perpetuated by the planting of infected kernels.

Good control of *G. moniliformis* in germination tests was given by semesan jr., followed by P–M–A, ceresan, and K–I–K, germisan being ineffective.

HIURA (M.). **Further note on the downy mildew of Setaria italica.**—Reprinted from *Byochugai Zasshi*, xvii, 8, 7 pp., 1930. [Japanese.]

The hyphae of the downy mildew [*Sclerospora graminicola*] of Italian millet (*Setaria italica*) [*R.A.M.*, ix, p. 774] were found in profusion within the tissues of the growing point of infected plants, indicating that the disease is of a systemic character.

Inoculation experiments showed that the seedling may be infected through the roots, coleoptile, and rhizomes. Infection of the roots mostly occurs during the period from the first appearance of the primary roots until they reach a length of 3 mm.; at 1·5 cm. they are already immune. The coleoptiles are susceptible to infection from their first appearance until the seedlings attain a height of 10 mm., no attacks occurring at 2 cm. and upwards. The rhizomes usually become infected during the period from their first appear-

ance until the seedlings reach a height of 5 mm., but the susceptible stage may persist in exceptional cases up to 3 cm.

The minimum, optimum, and maximum soil temperatures for infection were found to be 11°, 20°, and 34° C., the disease being most prevalent under relatively dry conditions (a water-holding capacity percentage of 37 to 41).

The fungus from *S. italica* is pathogenic to several varieties of maize, teosinte [*Euchlaena mexicana*], and green foxtail [*S. viridis*]. The *Sclerospora* occurring naturally on the last-named host [ibid., vii, p. 712] is considered to be distinct from *S. graminicola* on Italian millet, the two fungi reacting differently on certain plants.

Blanchard (E. E.). **Principales insectos y enfermedades que perjudican los cultivos citricos en la República Argentina.** [Principal insects and diseases which damage the Citrus cultivations in the Argentine Republic.]—*Min. Agric. Nac.* (*Buenos Aires*) *Secc. Prop. e Inform. Circ.* 815, 114 pp., 8 pl. (7 col.), 42 figs., 2 diags., 1930.

Notes are given in popular terms on the symptoms, etiology, and control of the following diseases of citrus in the Argentine. Gummosis (*Phytophthora parasitica*) [*R.A.M.*, viii, p. 238; ix, p. 647] is the foremost cause of damage to sweet oranges, and also attacks a number of other plants, including tomato [ibid., viii, p. 157], tobacco, *Ricinus* [*communis*: ibid., viii, p. 674], pineapple [ibid., iv, p. 528], and *Vinca*. The sour orange (*Citrus aurantium*) and *Poncirus trifoliata* are resistant to gummosis. Root rot (*Rosellinia necatrix*) [ibid., vii, p. 557] is most prevalent in the warmer regions of the country, and on sites cleared from forest. One of the most serious diseases of oranges in the north of Argentine is 'lepra explosiva' [eruptive leprosy] caused by *Amylirosa aurantiorum* [ibid., i, p. 351]. Scab (*Sporotrichum citri*) [ibid., ix, p. 450] is widespread throughout the Republic on sour oranges, grapefruit, mandarins [*C. nobilis*], and limes; sweet oranges are generally very resistant.

The other diseases described in this paper are melanose (*Phomopsis* [*Diaporthe*] *citri*) [ibid., viii, p. 99; ix, 658]; damping-off (*Pythium*, *Rhizoctonia*, and *Phytophthora* spp.); internal rot (*Alternaria citri*) [ibid., viii, p. 774; ix, p. 303], sometimes accompanied by *Sclerotium succineum*; blue and green moulds (*Penicillium italicum* and *P. digitatum*); black, grey, and white moulds (*Rhizopus nigricans*, *Botrytis cinerea*, and *Sclerotinia libertiana* [*S. sclerotiorum*]); mompa (*Septobasidium cavarae*, *S.* [*Helicobasidium*] *mompa*, and *S. bogoriense*) [ibid., ix, p. 562], occurring exclusively on branches infested by *Chionaspis* and other insects; sooty blotch (*Leptothyrium pomi*) [ibid., ix, p. 450]; sooty moulds (*Capnodium* [ibid., iii, p. 211], *Antennaria*, and other organisms); leaf spots due to *Mycosphaerella loefgreni* Noack, *Gloeosporium hesperidearum* Catt., *Cercospora fumosa* Penz., *Septoria limonum* [ibid., iii, p. 196], *Phyllosticta* spp., and an alga (? *Cephaleuros* sp.) [ibid., ix, p. 745]; blast (*Bacterium* [*Pseudomonas*] *citriputeale*) [ibid., vii, p. 628 *et passim*]; and various abnormalities of physiological origin, including exanthema [ibid., ix, p. 192], oleocellosis,

foliocellosis, chlorosis, foliar gummosis, and false melanose [ibid., vi, p. 148].

Directions are given for soil sterilization and for the preparation of some standard insecticides and fungicides.

MORADA (E. K.). **Observations on the important diseases of Citrus at the Lamao Experiment Station.**—*Philipp. Journ. of Agric.*, i, 2, pp. 195–229, 11 figs., 1930.

The most destructive diseases of citrus trees at the Lamao Experiment Station, Bataan, Philippine Islands, are bark rot [*R.A.M.*, viii, p. 25] and pink disease (*Corticium salmonicolor*) [ibid., v, p. 283], the former being responsible for 98 per cent. of the dead trees observed during the years 1922–4, inclusive, and the latter for the remaining 2 per cent. The trees examined were budded on various stocks [which are listed] and ranged from 2 to 13 years from transplanting.

Bark rot, the cause of which is obscure, primarily affects the trunk and branches. The slightly raised, cracked portions of the bark, measuring 1 to 10 cm. by 3 to 10 mm., exude a gummy substance. The wood below the diseased bark, which emits a disagreeable odour, is slightly brownish. On mandarins (*Citrus nobilis*) the cracking of the bark and gummy exudate do not occur in the early stages of the disease; later the leaves turn yellow and the fermenting gum exhales a putrid odour attractive to insects. The lowest average infection (13·33 per cent.) during the period under review occurred in the sour orange (*C. aurantium*) which, together with *C. mitis* and an unidentified species, is recommended for stock purposes, and the highest (100 per cent.) in *C. southwickii* (two years only). Promising results in the control of bark rot were given by the application of carbolineum through parallel and transverse cuts, about 3 mm. in width and reaching to the wood, the average cost of the treatment being 40 centavos [100 centavos = approx. 2*s.*] per tree.

Pink disease may occur either in association with bark rot or independently; in the latter case a network of mycelium is seen on the bark encircling the affected parts of the tree. Eventually the fungus penetrates the bark, which rots and shrivels, and reaches the wood. Nothing but the prompt application of curative treatment (destruction of infective material and washing with 5 per cent. formaldehyde solution) can save the diseased parts of trees attacked. The following varieties remained immune from infection during the period under review: sour orange, *Citrus webberi*, *C. limonia*, *C. longispina*, *C. medica*, *C. micrantha*, *C. miary*, and *C. southwickii*.

Canker (*Pseudomonas citri*) [ibid., viii, p. 775] was found to attack all the species of citrus cultivated at Lamao, except *C. nobilis*, *C. mitis*, and kumquats (*Fortunella japonica*). Bordeaux mixture or lime-sulphur applied before and after the rainy season gives the best measure of protection. Diseased parts should be removed and burnt to lessen infection.

Foot rot [ibid., v, p. 283] is a disease of unknown origin resembling bark rot, except that it occurs only at the roots and on the trunk not more than a foot from the ground. The bark decays in

a downward direction and exudes gum. Hitherto the disease has caused no serious damage at Lamao.

Mottled leaf [ibid., viii, pp. 208, 717] was most prevalent on *C. mitis*, *C. longispina*, *C. hystrix*, *C. nobilis*, and *C.* sp.

STOUGHTON (R. H.). **The influence of environmental conditions on the development of the angular leaf-spot disease of Cotton. II. The influence of soil temperature on primary and secondary infection of seedlings.**—*Ann. of Appl. Biol.*, xvii, 3, pp. 493–503, 1930.

Continuing his study of the angular leaf spot disease of cotton (*Bacterium malvacearum*) under controlled environmental conditions [*R.A.M.*, ix, p. 523], the author gives details of experiments at the Rothamsted Experimental Station conducted with a view to determining the effect of soil temperatures on primary and secondary infection of cotton seedlings. The results of the tests, which included surface-disinfected seed, seed soaked in a heavy suspension of a virulent strain of *Bact. malvacearum*, seed artificially infected internally, and seed derived from heavily infected plants as controls, showed that the last-named category of seed may produce infected seedlings. In such cases the infection is due to bacteria carried on the outside of the seed and in the fuzz [cf. ibid., ix, p. 779], since thorough surface disinfection of the seed resulted in the production of healthy seedlings. The experiments also showed that, within the range of soil temperature tested, namely, from 15° to 40° C., there was a steady fall in average primary infection of the seedlings raised from infected seed at temperatures above 30°, but infection was not inhibited even at 40°. Secondary infection, as indicated by experiments where seedlings were sprayed with suspensions of the organism, was little, if at all, influenced by the temperature of the soil, but there was evidence to confirm the view that infection is easily transmitted by contact from one plant to another under humid conditions. Finally, it was shown that cotton plants diseased in the seedling stage may outgrow the disease, if no further infection occurs.

STOUGHTON (R. H.). **Black-arm or angular leaf spot disease of Cotton plants.**—*Rept. Conf. Cotton Growing Problems, 1930*, pp. 130–144, London, Empire Cotton Growing Corporation 1930.

In this paper, and in the discussion which followed its presentation at the conference on cotton-growing problems held at the Shirley Institute, near Manchester, in August, 1930, the author gives a brief review of the present state of knowledge of the black arm or angular leaf spot disease (*Bacterium malvacearum*) of cotton, and also of the work which is being done on this organism at the Rothamsted Experimental Station [see preceding abstract]. In the course of the discussion, Martin stated that the first occurrence of black arm noticed in Uganda [*R.A.M.*, ix, p. 590] was on a very light sandy soil which had been under water for a considerable period and in which there was a definite pan crumbling like sandstone when dried; this observation led him to suggest that a good deal of the incidence of black arm is due to lack of

room for the root development of the host plant, a view which is supported by the fact that the disease later spread to districts where there was a solid layer of clay in the soil. In regard to the question of the value of seed disinfection for control purposes, Lewin said that in Nigeria the balance of opinion favours the view that, while external disinfection undoubtedly reduces the amount of disease, under present conditions in that country it is hardly worth while, the more so since a fair amount of control is obtained by growing cotton in combination with yams [*Dioscorea* spp.], which presumably check dissemination by rain. Referring to the suggestion that black arm may be a debility disease, Nowell said that he was inclined to think that the condition could not be thus described, very vigorous plants being readily and severely attacked. The environment appeared to be the determining cause of the varying manifestations of the disease.

CASTELLANI (A.). **The fungi found in North American blastomycosis; their plurality of species.**—*Brit. Journ. of Dermatology*, xlii, 8–9, pp. 365–374, 2 pl. (1 col.), 5 figs., 1930.

Notes are given on the cultural characters of *Blastomycoides* (*Coccidioides*) *immitis* [*R.A.M.*, ix, p. 780], *B. dermatitidis*, *B. tulanensis* [ibid., viii, p. 574], and *B. lanuginosus*. The last-named organism is characterized on glucose agar and mannitol by a white to yellowish, woolly growth. It liquefies gelatine and serum within a week from inoculation. In peptone water hanging drop cultures an abundant mycelium is produced, the average width of the hyphae being 4·5 μ (minimum 1·5, maximum 7·5 μ). Conidia of a peculiar oval shape are occasionally observed. In scrapings and sections of the granulomatous lesions large roundish or oval free bodies are found, 10 to 20 μ in diameter or even much larger; there is a well-defined double contour and the protoplasm contains numerous granules or spherules.

AARS (C. G.). **Piedra.**—*Arch. of Dermatology*, xxii, 3, pp. 401–409, 9 figs., 1930.

A description of piedra is given, based on 60 cases observed in Dutch Guiana. The condition is stated to be common, especially among men, at Paramaribo; it is only slightly infectious and readily yields to curative treatment. The causal fungus (*Trichosporum* [*Piedraia*] *hortai* or *T. paraguayo*) [*R.A.M.*, ix, p. 720] is not a true ectothrix, many cases in which the cuticle of the hair was damaged having been examined; the hair roots are not involved. Perithecia are present in the dark nodules, with asci containing eight fusiform, unicellular spores, provided with two (occasionally three) filiform prolongations at the ends. No mycelium was produced in hanging drops, but very old cultures showed chlamydospore formation.

SARTORY (A.), SARTORY (R.), HUFSCHMITT (G.), & MEYER (J.). **Un cas d'onychomycose provoquée par un Eurotium nouveau: Eurotium diplocyste n. sp.** [A case of onychomycosis induced by a new *Eurotium*: *Eurotium diplocyste* n. sp.]—*Comptes rendus Soc. de Biol.*, civ, 23, pp. 881–883, 1930.

A brief account is given of a case of onychomycosis affecting the

left thumb and the toe-nails of both feet in an 18-year-old girl. The fungus isolated from a nail on the right foot and grown on Sabouraud's medium at 27° C. was characterized by conidiophores measuring 50 to 100 by 3·1 to 3·7 μ, claviform basidia, 5 to 6·25 by 1·5 to 2·5 μ, with four sterigmata bearing green, echinulate, elliptical conidia, 2·75 to 3·1 by 2·25 to 3 μ in diameter. The perithecia were canary-yellow, spherical or ovoid, and 50 to 55 by 43 to 50 μ in diameter, and the asci measured 5 to 7·5 by 4 to 6 μ, each containing eight ascospores, 1·85 to 3·1 by 1·5 to 2·5 μ. The fungus is named *Eurotium diplocyste* n. sp. The condition proved refractory to treatment, but some improvement was effected by novarsenobenzol and applications of iodide, &c.

BERNTON (H. S.). **Asthma due to a mold—Aspergillus fumigatus.**—*Journ. Amer. Med. Assoc.*, xcv, 3, pp. 189–190, 1930.

Clinical details are given of a case of asthma of nine years' duration in a woman aged 34 at Washington, D.C. The first attack occurred after four years' residence in a damp and very musty brick house. Cutaneous tests with representative plant pollens, food and epidermal proteins, and a stock house dust gave negative results. A preparation of *Aspergillus fumigatus* was one of 13 mould reagents to yield a strongly positive cutaneous and intracutaneous reaction [*R.A.M.*, ix, p. 184]. An extract of this organism in a dilution of 1 in 5,000, administered subcutaneously, induced a marked local reaction and provoked the asthmatic condition. This patient was the only one of 125 to react positively to mould reagents, an incidence of 0·8 per cent.

BERGMAN (R.) & HENSCHEN (F.). **Zur Kasuistik der Lungenaspergillose.** [On the etiology of pulmonary aspergillosis.]—*Beitr. Klin. Tuberk.*, lxxiii, 4, pp. 467–484, 8 figs., 1930.

Full details are given of a fatal case of pulmonary aspergillosis due to *Aspergillus fumigatus* [see preceding abstract] in a 61-year-old woman at Stockholm. The disease was of long standing (probably twenty years) and was accompanied by frequent haemoptyses. The rooms occupied by the woman were damp and her work as a dressmaker involved the inhalation of dust, both of which factors contribute to infection by this class of fungi [cf. *R.A.M.*, viii, p. 646].

ABRIKOSSOFF (A.). **Ueber 'Splenomykosen' und 'mykotische Splenomegalien'.** [On 'splenomycoses' and 'mycotic splenomegalies'.]—*Virchows Arch.*, cclxxii, pp. 593–612, 16 figs., 1929. [Abs. in *Trop. Dis. Bull.*, xxvii, 7, p. 534, 1930.]

From a review of the recent literature on mycotic splenomegaly and from his own investigations the author concludes that the mycelial-like structures incrusted with iron salts found in [Gandy-Gamna] nodules in spleens are in no way associated with fungi, but arise from haemorrhages followed by impregnation and incrustation of degenerated tissue elements with iron salts. Where *Aspergillus* was isolated from spleens the fungus was merely secondary. The mycotic origin of splenomegaly is not proved,

and in the light of existing knowledge the author considers it to be improbable [cf. *R.A.M.*, ix, p. 779].

DA VEIGA (A.). **Algumas especies novas de cogumelos causadores de tinhas.** [New species of fungi causing tineas.]—*Brasil-Medico*, xliii, 29, pp. 830-838, 4 figs., 1929. [Abs. in *Trop. Dis. Bull.*, xxvii, 7, p. 515, 1930.]

Four new species of *Trichophyton* from ringworms are described and compared with known species; they are *T. bicolor* (reddish-yellow and green colour on growth), *T. flaviviréns* (also with a green growth), *T. cineraceum*, and *T. acutulum*. The first-named was highly contagious and the cultures retained vitality for at least two years, giving exuberant growth on sub-culture.

CATANEI (A.). **Étude des modifications des caractères culturaux d'un Trichophyton gypseum.** [Study of the modifications of the cultural characters of *Trichophyton gypseum*.]—*Arch. Inst. Pasteur d'Algérie*, vii, 3–4, pp. 287–302, 3 pl., 1929. [Received November, 1930.]

This is a more comprehensive account of the modifications undergone by subcultures of *Trichophyton gypseum* isolated from a human ringworm in Algeria than that already noticed from another source [*R.A.M.*, ix, p. 314].

GLASSER. **Contribution à l'étude du 'Trichophyton gypseum granulosum'.** [Contribution to the study of *Trichophyton gypseum granulosum*.]—Thèse de Strasbourg, 1929. [Abs. in *La Presse Méd.*, *1930*, p. 818, 1930.]

Since the war, *Trichophyton gypseum granulosum* [*R.A.M.*, ix, p. 383], formerly a rare fungus, has occurred in epidemic form in a number of places. The organism is primarily of equine origin; on man it is disseminated mainly through sanatoria and similar institutions. There is no mycological difference between the strains giving rise to superficial lesions and those causing deep ulcers. In the former case the injury is confined to epidermal pustules, whereas in the latter the parasite traverses the hair and penetrates the skin.

PECK (S. M.). **Epidermophytosis of the feet and epidermophytids of the hands. Clinical, histologic, cultural and experimental studies.**—*Arch. of Dermatol.*, xxii, 1, pp. 40–76, 1 col. pl., 11 figs., 1930.

A study of 23 new cases of epidermophytosis of the feet, accompanied by dysidrotic or squamous changes on the hands, substantiated the conclusions of Jadassohn and Peck [*R.A.M.*, ix, p. 383] as to the secondary nature of the latter condition.

With one exception no fungi were found in the epidermophytid lesions on the hands while they always occurred in the lesions on the feet, Kaufmann-Wolf's *Epidermophyton* being isolated from 15 cases. Four varieties of the fungus were cultivated, viz., a type resembling *Achorion quinckeanum*, a *Trichophyton gypseum* type, a cerebriform type, and a coarsely red granular form not hitherto described. The fungi were found in the keratin layers but in one section they were observed in the vesicle itself. The resemblance

of the epidermophytids to eczema was striking, both histologically and clinically, and it is believed that *Epidermophyton* and possibly other parasites play a much greater rôle in this disease than has hitherto been suspected. In one case it was possible to culture *Epidermophyton* not only from the lesions on the feet, but also (in analogy with the observations in the case of trichophytids) from the blood [ibid., viii, p. 506].

The complete disease syndrome—epidermophytosis of the feet followed 24 days later by epidermophytid of the hands—was produced by inoculation with Kaufmann-Wolf's *Epidermophyton* in a previously healthy, trichophytin-negative person. This is believed to be the first instance of the production of a 'mycid' in a previously healthy subject. The intracutaneous injection of trichophytin was consistently followed by a positive local reaction.

BRUHNS (C.) & ALEXANDER (A.). **Mykologische Beiträge. II. Atypische Form des Kaufmann-Wolfschen Pilzes (Epidermophyton inguinale). III. Ein Fall von Epidermophyton lanoroseum. IV. Einige Bemerkungen über den Ursprung und die Abstammung unserer Dermatophyten.** [Mycological contributions. II. Atypical form of the Kaufmann-Wolf fungus (*Epidermophyton inguinale*). III. A case of *Epidermophyton lanoroseum*. IV. Some observations on the origin and derivation of our dermatophytes.]—*Dermatol. Wochenschr.*, xci, 33, pp. 1250–1253, 2 figs., 1930.

Cultures of *Epidermophyton inguinale* [*R.A.M.*, ix, p. 183], isolated from vesicular lesions on the foot of an eight-year-old girl, presented a greyish-brown, radial, cerebriform appearance somewhat resembling that of *Trichophyton cerebriforme* but totally unlike the cerebriform variety of the Kaufmann-Wolf fungus [see preceding abstract]. In other tubes the cultures were similar to those of *T. gypseum asteroides*. After a succession of subcultures the normal form of *E. inguinale* developed.

E. lanoroseum [ibid., vii, pp. 634, 635] was recently isolated at Wiesbaden from lesions resembling those of 'eczema marginatum' in a man who had lived for some time at Bombay.

A fungus isolated from grasshoppers in a suburb of Berlin was identified as *Achorion schoenleini* [ibid., ix, p. 653]. Presumably the insects must have contracted the infection through some natural source, suggesting that the so-called human pathogens may originally have been field parasites which have gradually adapted themselves to man.

PRIBRAM (E.). **Ringworm of the scalp caused by Alternaria tenuis Nees.**—*Journ. Infect. Dis.*, xlvii, 1, pp. 11–15, 3 figs., 1930.

From several cases of non-inflammatory ringworm in children's scalps the writer isolated a fungus characterized by a dark, branching, septate mycelium forming occasional chlamydospores and numerous dark-brown, fusiform, clavate, pluriseptate, concatenate conidia. The organism is referred to *Alternaria tenuis* [*R.A.M.*, ix, p. 384], this being apparently the first record of ringworm due to a member of the genus in question.

NAOUMOVA (Mme N. A.). К вопросу о биологии **Colletotrichum lini Bolley.** [On the question of the biology of *Colletotrichum lini* Bolley.]—*Morbi Plantarum*, Leningrad xviii, 4. pp. 218–230, 4 graphs, 1929. [German summary. Received November, 1930.]

A brief account is given of greenhouse experiments which were made at the Leningrad Phytopathological Station for the purpose of establishing the mechanism of infection of flax seedlings by *Colletotrichum lini* [*R.A.M.*, ix, p. 246], in which naturally infected flax seeds were sown at depths varying from 0·5 to 3 cm. The resulting infection of the seedlings could be divided into five different types, according to the character and location of the lesions, namely, (1) spots on the cotyledons; (2) spots on the root collar; (3) spots both on the cotyledons and root collar; (4) constrictions at the collar; and (5) constrictions at the collar together with spots on the cotyledons. The first two types only slightly retarded the growth of the seedlings; the third depressed the development of the plants to a greater degree; and the last two resulted in a serious stunting or the death of the seedlings. A striking feature of these experiments was that in every case where the hypocotyl of the seedling was attacked, the primary symptoms invariably appeared at the collar. Subsidiary tests with healthy flax seeds sown in soil artificially infected with *C. lini* showed that under such conditions lesions may develop at any point of the hypocotyl node in immediate contact with the mycelium of the fungus, this being considered to indicate that the root collar of the flax seedling is not specifically more susceptible than the rest of the hypocotyl. The roots and rootlets were distinctly more resistant than the hypocotyl.

In the case of naturally infected seed there was no evidence of a correlation between the extrusion of the seed envelope from the soil and infection of the seedling. Depth of sowing had apparently no effect on the percentage of infection, but was directly related to the dimensions of the developing lesions on the underground parts. It was observed, however, that the percentage of seedlings killed by the fungus decreased at the greater depths, this being explained by the greater vigour of the seedlings which were able to throw out new roots above the point infected.

The conclusion arrived at from the investigation is that primary infection of the seedlings apparently occurs at the point of contact of the growing germ with the edges of the seed envelope which carries the mycelium of the fungus.

MORSTATT [H.]. **Blattkrankheiten der Sisalagave.** [Leaf diseases of the Sisal Agave.]—*Der Tropenpflanzer*, xxxiii, 8, pp. 307–312, 1930.

Notes are given on some leaf diseases of sisal [*Agave rigida* var. *sisalana*] in East Africa. Anthracnose (*Colletotrichum agaves*) [*R.A.M.*, i, p. 1; viii, p. 632] frequently accompanies sun scorch in Kenya and Tanganyika. A leaf disease of minor importance and undoubtedly of physiological origin is characterized by small, pale yellow, soft, scattered, irregular, slightly raised spots on the upper side, sometimes arranged in rows near the leaf margin and often

exuding resin droplets. Considerable damage is caused by a hitherto undescribed disease in which pale, irregularly elongated-oval spots develop on the upper side of the leaves.

The so-called 'banding disease' (*Tanganyika Times*, p. 14, 11th April, 1930) has recently been observed in the vicinity of Tanga, Dar-es-Salaam, and elsewhere in East Africa. A broad band of black, slightly shrivelled tissue is found near the leaf base, mostly on the under side, the outermost leaves only being affected. This disturbance appears to be due primarily to unfavourable soil conditions, e.g., waterlogging, deficiency of nutrient substances, excessive dryness, and the like. Both young ($1\frac{1}{2}$-year-old) and fully-grown plants are liable to the banding disease, the control of which should be based on the improvement of soil conditions by drainage and covering the ground with plant refuse (after thorough cleansing), as well as by the use of green manures. A disturbance apparently distinct from the foregoing is reported to affect sisal growing on infertile soils in the Congo territory. The wilting and shrivelling of the lower leaves of sisal (beginning in any part of the leaf and also observed on the ornamental *A. americana*) is probably due to extreme conditions of soil moisture and temperature.

FUKUSHI (T.). **Aster yellows in Japan.**—*Agric. & Hort.*, v, pp. 577–584, 3 figs., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 2, p. (31), 1930.]

No trace of any parasitic organism has been found in plants affected by aster yellows [*R.A.M.*, ix, pp. 224, 261, 289] in Japan, and the disease is consequently attributed by the writer to a virus.

BRASSLER (K.). **Hortensien-Mehltau.** [Hydrangea mildew.]—*Blumen- und Pflanzenbau*, xlv, 7, pp. 111–112, 1930.

The writer's laboratory experiments do not bear out E. Schmidt's statements (*Gartenbauwirtsch.*, 16, 1930) regarding the alleged immunity from mildew (*Oidium hortensiae*) of certain hydrangea varieties [*R.A.M.*, vii, p. 447]. Generally speaking, the deep-coloured varieties are more resistant than the pale ones, but all appear to be more or less susceptible if exposed to infection under conditions favouring the growth of the fungus.

VAN SLOGTEREN (E.) & THOMAS (K. S.). **Smeul, een Tulpenziekte, veroorzaakt door een schimmel, Sclerotium perniciosum nov. spec.** [Smoulder, a Tulip disease caused by a fungus, *Sclerotium perniciosum* n. sp.]—Reprinted from *Weekblad voor Bloembollencultuur*, xli, 15, 12 pp., 6 figs., 1930.

Particulars are given of a serious disease of tulips in Holland caused by a fungus which is named *Sclerotium perniciosum* n. sp. [with a diagnosis in Dutch]. In cultural characters the organism agrees closely with *Botrytis tulipae*, but in symptomatology, distribution, and pathogenicity it bears a stronger resemblance to *S. tuliparum* [*R.A.M.*, viii, p. 40]. The economic importance of the new fungus is considered to be even greater than that of *S. tuliparum*, since the former is transmitted by the small bulbs (which are planted without previous peeling) as well as through the soil.

The disease occurs mainly on dark clay soils. The leaves of

affected plants are wilted, and the rotten petioles are often covered with a network of white mycelium, sometimes accompanied by small, black sclerotia very similar to those of *B. tulipae*, which may also occur as a secondary invader of the diseased tissues. In plants developing from larger bulbs the stems are decayed and sclerotia are frequently observed at the base.

S. perniciosum grows well on cherry and malt agars, forming a somewhat sparse silvery mycelium with appressoria and sclerotia measuring 1 to 2 by 0·5 to 1 mm. In one instance microconidia were detected, but otherwise no fructifications have been observed either in nature or in culture. The minimum, optimum, and maximum temperatures for the development of the fungus were found to be under 5°, 20°, and 30° C., respectively.

In addition to cultural measures [which are briefly indicated] the disease may possibly be combated (where economic considerations permit) by steam sterilization of the soil and fungicidal treatment of the bulbs.

WALTER (E.). **'Uropixis sanguinea', Urédinée américaine, arrivée en France.** [*Uropyxis sanguinea*, an American Uredine, arrived in France.]—*Bull. Soc. Bot. de France*, lxxvii, 1–2, pp. 53–54, 1930.

Attention is drawn to the discovery, during 1929–30, of *Puccinia mirabilissima* (*Uropyxis sanguinea*) on *Mahonia* [*Berberis*] *aquifolium* in several localities of Alsace-Lorraine and in the public gardens of Paris [*R.A.M.*, ix, p. 787]. The fungus causes extensive defoliation during the winter.

DUCOMET (V.). **Une Urédinée nouvelle pour la France, Puccinia mirabilissima Peck parasite du Mahonia aquifolium.** [A species of the Uredineae new to France, *Puccinia mirabilissima* Peck. parasitic on *Mahonia aquifolium*.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 256–261, 1930.

In this paper the author states that *Puccinia mirabilissima* [see preceding abstract] was first noticed in France on *Mahonia* [*Berberis*] *aquifolium* in 1928 in the grounds of the École d'Agriculture at Grignon, since when it was found to be rather prevalent in neighbouring localities and in the vicinity of Colmar and Mulhouse. This statement is followed by a discussion of the probable origin of the disease.

MILLER (E. W.). **Rust disease of Berberis (Mahonia) aquifolium.** —*Gard. Chron.*, lxxxviii, 2277, p. 131, 1930.

Attention is drawn to the recent detection (1st June, 1930) of *Puccinia mirabilissima* in the uredo- and teleutospore stages on *Berberis* (*Mahonia*) *aquifolium* bushes [see preceding abstracts] near Slaley, Northumberland, this being apparently the first record of the rust in England. According to W. B. Grove, to whom the material was submitted, *P. mirabilissima* has also been present in Latvia since 1928. Presumably the rust was introduced into Northumberland from Scotland, although the length of time (eight years) it has taken to cross the border is surprising.

DODGE (B. O.) & SWIFT (MARJORIE E.). **Notes on Boxwood troubles.**—*Journ. New York Bot. Gard.*, xxxi, 368, pp. 191–198, 2 figs., 1930.

Box [*Buxus sempervirens*] in New York and New Jersey is liable to leaf spot and canker associated with *Macrophoma candollei* [*R.A.M.*, vi, p. 619] and *Volutella buxi*. The dead or dying terminal leaves of affected branches present a marked contrast to the deep-green lower ones. *V. buxi*, the pale pink spore masses of which were found in profusion along the petioles and midribs of the yellowed leaves of the specimens examined, is apparently the primary cause of the disturbance. Microscopic examination revealed the presence of typical hyaline, blunt, septate hyphae interspersed among the somewhat waxy spore clumps. Closely associated with the *Volutella*, which is usually assumed to be the imperfect stage of *Nectria rousselliana* [ibid., vi, p. 336], was the fungus commonly known as *Verticillium buxi*, which the writers showed by culture experiments to be identical with *Volutella buxi*.

The tips of the leaves infected by *M. candollei* are noticeably thinner than the rest of the leaf and are dotted with the pycnidia of the fungus.

A canker associated with the above-mentioned organisms has been recorded from New Jersey (*New Jersey Agric. Exper. Stat. Nursery Disease Notes*, i, 12, 1929). The dead and dying twigs show a loose, blackened bark, the discoloration often penetrating to the heartwood. Infection is believed to occur through old branch stubs or injuries. The causal organisms probably overwinter in the old diseased leaves which become lodged in the moist centre of the thick bushes, where ideal conditions for further development prevail. The control measures suggested against these diseases include excision and destruction of infected material and the application of 4–4–50 Bordeaux mixture immediately prior to the commencement of growth in the spring.

SALMON (S. C.). **The reaction of Alfalfa varieties to bacterial wilt.**—*Journ. Amer. Soc. Agron.*, xxii, 9, pp. 802–810, 1930.

Details are given of a series of experiments conducted on the reaction of different varieties of lucerne to bacterial wilt (*Aplanobacter insidiosum*) [see above, p. 13]. In a three-year test at Manhattan, Kansas, the highest percentage of wilted plants observed at any one time in the Provence variety was 3·5 and of dead plants 7·8, the corresponding figures for Turkestan being 3·9 and 7 and for Ladak 9·2 and 14·3. On the other hand, 32·5 per cent. of the 444 Grimm plants showed wilt infection in July, 1927, while by April, 1928, 39·1 per cent. were dead. In July, 1927, 22·5 per cent. of the 435 Kansas Common plants were infected, and by the following spring 4·6 per cent. were dead. In another series of tests in various localities of eastern Kansas the average infection of Grimm was 18·3 per cent. compared with 4·6 per cent. for Kansas Common. Provence was the most resistant to winter injury of the above-mentioned varieties and Kansas Common the least so, Utah Common also being highly susceptible.

DICKINSON (L. S.). **The effect of air temperature on the pathogenicity of Rhizoctonia solani parasitizing grasses on putting-green turf.**—*Phytopath.*, xx, 8, pp. 597–608, 2 graphs, 1930.

A summary of field observations at the Massachusetts Agricultural College on the conditions governing the development of brown patch (*Rhizoctonia* [*Corticium*] *solani*) on putting-greens [*R.A.M.*, viii, p. 138] clearly indicates the importance of air temperature for the growth of the fungus. The optimum temperature range for the growth of the short mycelia from the sclerotia appears to lie between 64° and 68° F., while virulence appears to require a fairly rapid rise in temperature to between 80° and 85°. If the temperature falls below 62° the mycelia on the sclerotia are destroyed.

The results of pot experiments showed that the growth of mycelial colonies from the sclerotia was increased and accelerated by chilling the latter to the optimum range for 45 minutes; at the end of this period 60 per cent. of all the sclerotia placed in the cool chamber showed a short mycelial growth, which was absent in the case of those kept at a constant temperature. The sclerotia were found to produce more abundant mycelium on soil than on creeping bent grass [*Agrostis stolonifera*].

The appearance of *C. solani* may be accurately predicted on the basis of meteorological data, thereby limiting the application of control measures (fungicidal treatment or attrition by sweeping the surface of the turf with a bamboo pole) to the critical periods and so effecting a considerable economy.

DIEHL (W. W.). **Ephelis-like conidia and floret sterility in Aristida.**—*Phytopath.*, xxx, 8, pp. 673–675, 2 figs., 1930.

Aristida glauca in Lampasas County, Texas, was observed in 1924 to be attacked by a sclerotioid fungus bearing a close resemblance to *Balansia hypoxylon* Atkinson (*Ephelis borealis* E. & E.).

Diseased plants differ so widely from the normal that they are scarcely recognizable as the same species. The entire inflorescence is dwarfed and the individual spikelets stunted; the glumes measure only about one-sixth of the normal in length, though nearly normal in width, and the florets are proportionately reduced in size. The grains failed to develop even in cases of slight infection, and where this was extensive the entire floret was eliminated with the exception of the lemma, which remained as a rind.

The mature, grey to brown or black sclerotioid masses are variable in size, but apparently do not exceed 2 mm. in length. These bodies differ from those hitherto recognized in *Ephelis* by the occurrence in the central cavity of acicular conidia, hyaline when single and dark greenish in the mass, measuring 20 to 23 (rarely up to 29) by 1 to 2 μ, and borne on short conidiophores not exceeding 3 by 1 μ in diameter. The conidia are regularly constricted and frequently divided into three segments, which possibly separate at maturity. The protoplasm of the conidia is markedly guttulate. Attempts to cultivate the fungus failed.

PAILLOT (A.). **Sur le traitement d'hiver des arbres fruitiers par l'émulsion d'huile anthracénique en bouillie bordelaise.** [On the winter treatment of fruit trees by the emulsion of anthracene oil in Bordeaux mixture.]—*Comptes Rendus Acad. d'Agric. de France*, xvi, 22, pp. 780–782, 1930.

Attention is again drawn to the efficacy of Bordeaux mixture with anthracene oil (2 per cent. copper sulphate, 3 per cent. lime, and anthracene oil at the rate of 10 l. per 90 l. of the mixture) in the control of fungous diseases and insect pests of fruit trees [*R.A.M.*, iii, p. 288]. A pear orchard in a north-west suburb of Lyons has been treated regularly each winter for the last five years by this method, with the result that the trees have remained entirely free from *Sphaeropsis pseudo-diplodia* [*Physalospora cydoniae*] and *Venturia pirina*.

The same treatment, applied early in March to peach trees in Drôme, gave excellent protection against shot hole (*Coryneum*) [*Clasterosporium carpophilum*] and leaf curl [*Taphrina deformans*].

MARTIN (W. H.) & CLARK (E. S.). **Orchard disease investigations.** —*Fiftieth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 260–262, 1929. [Received October, 1930.]

The first discharge of ascospores of the apple scab fungus [*Venturia inaequalis*] was recorded at Bridgeton on 10th April and at New Brunswick one day later [*R.A.M.*, ix, p. 320]. In southern Jersey the dates of maturity of the ascospores varied from 17th March to 14th April and in the central districts from 6th to 17th April, while leaves from two stations in the north showed mature spores on 17th and 19th April. Throughout May and the first week of June very heavy ascospore discharges occurred at Del-Bay Farms, Bridgeton. The delayed dormant spray proved more important than the pre-pink, the omission of the former resulting in only 69·2 per cent. clean fruit as compared with 84·4 per cent. for the latter. Where both these sprays were omitted there was only 48·9 per cent. clean fruit.

Fruit spot [of apple: *Phoma pomi*: ibid., ix, p. 508] was well controlled by spraying with 2–6–50 Bordeaux mixture.

HEADLEE (T. J.), MARTIN (W. H.), & FARLEY (A. J.). **1930 spraying recommendations for Apples.**—*New Jersey Agric. Exper. Stat. Circ.* 220, 7 pp., 1930.

The following treatments are recommended for the control of scab [*Venturia inaequalis*] and other fungous diseases and insect pests of apples under average conditions in New Jersey. (1) Delayed dormant: oil emulsion (for insects only); (2) special scab spray to be applied immediately on receipt of a notification from the county agent that the ascospores of the fungus are mature [see preceding abstract]: lime-sulphur 1 to 20 if before, or 1 to 40 if after, the pre-pink stage; (3) when the fruit buds of Stayman, Baldwin, or Delicious first show colour (for scab, etc.): lime-sulphur 10 to 100 plus 3 lb. lead arsenate; (4) directly after petal fall and

before the calyx closes (for scab and insects): New Jersey dry-mix (25 lb. per 100 galls.), finely divided colloidal sulphur, or lime-sulphur (8 quarts to 100 galls.) where foliage injury is not anticipated, plus lead arsenate; (5) and (6) 7 and 17 days, respectively, after petal fall: as under (4).

MOORE (M. H.). **The incidence and control of Apple scab and Apple mildew at East Malling.**—*Journ. Pomol. and Hort. Science*, viii, 3, pp. 229–247, 4 pl., 1930.

Full details are given of spraying experiments in the control of apple scab [*Venturia inaequalis*] which were conducted from 1927 to 1929 at the East Malling Research Station in continuation of the work initiated in 1926 by Miss Frampton [*R.A.M.*, viii, p. 178], and also of methods devised by the author for obtaining comparable data in the estimation of the development of scab lesions on young shoots, leaves, and apple fruits. Excellent control was afforded by one pre-blossom and two post-blossom applications of either Bordeaux mixture or lime-sulphur [at the concentrations given in the previous paper], both containing lead arsenate which appeared slightly to increase the efficacy of lime-sulphur against leaf infections. While Bordeaux mixture was, on the whole, the more effective of the two, its use on Cox's Orange Pippin is not advisable owing to the severe injury it causes to this variety. One pre-blossom or two post-blossom applications of either spray gave only partial control; a measure of success was also given by post-blossom applications of colloidal sulphur or very weak (1 in 150) lime-sulphur, neither of which was consistently better than the other. Preliminary experiments in 1929 with three proprietary dusting sulphurs showed them to be slightly inferior in efficacy to lime-sulphur spray, although the differences in the figures of estimated scab development were not very significant. There was no consistent evidence of injury following treatment with these dusts.

On the young wood of Cox's Orange Pippin the scab pustules were shown to consist of a series of 'pads' of mycelium separated by corky tissue. The bark covering the pads splits in due course, and the spores are liberated in succession from the top to the lowermost pad over a considerable period of time.

The investigation also indicated that the rootstock has a marked influence on the degree of infection by scab; for example, unfruiting Cox's Orange Pippin trees grafted on type XV stock consistently gave the lowest percentage of scab on the twigs and on the leaves, while comparable results were obtained with the fruit of Bramley's Seedling and Worcester Pearmain on the other stocks in 1929.

The results of manurial experiments in 1929 showed that Bramley's Seedling and Worcester Pearmain on starved land were very much more heavily scabbed than those on manured plots. This conclusion was supported by certain data obtained in the previous year. There was no indication that the effect was due to any specific component, but there was some evidence of a differential effect of manuring on the influence of the rootstock.

Butler (L. F.). **Corticium centrifugum, a heterothallic pathogene of Apples.**—*Journ. Agric. Res.*, xli, 4, pp. 269–294, 1 col. pl., 2 figs., 1930.

This is a detailed account of the rot of apples briefly described in a previous paper [*R.A.M.*, vii, p. 249] under the name *Hypochnus* rot (but now termed fish-eye rot), the symptoms of which are very similar to those of a rot of American north-western apples caused by a sterile mycelium and locally known as false anthracnose. Comparative cultural studies [details of which are given] showed that both rots are caused by the same fungus, identified as *Corticium centrifugum* [ibid., ix, p. 449], a technical description of which in pure culture is appended. The fungus was found to be heterothallic. Four types of haplonts were produced by the individual perfect strains, the genotypic formula for the fusion nucleus of which may be written Aa Bb. A genetical discussion of the results obtained from crossed cultures of sterile strains indicates that these results agree well with those of other investigators for other species of Hymenomycetes.

The disease is stated to be rather widespread in the United States. It has been reported from the States of New York, Washington, and Oregon, and the rot caused by it has also been found on apples marketed from southern Illinois, Idaho, and Virginia. The indications are that infection of the apples occurs in the orchards, and that the disease develops but does not spread in transit or storage. Temperature studies showed that the rot progresses at the ordinary cold storage temperature (32° F.); the vegetative growth of the fungus is favoured by high humidity and is extremely sensitive to desiccation.

Laubert [R.] **Zwei Fleckenkrankheiten der Winteräpfel.** [Two spot diseases of winter Apples.]—*Obst- und Gemüsebau*, lxxvi, 8, pp. 129–130, 2 figs., 1930.

Popular notes are given on two fungous diseases of stored apples observed by the writer in Germany during the past winter. 'Black pitting' is characterized by the development of numerous spherical, brownish or jet-black, slightly depressed spots, 0·5 to 5 mm. in width, on the surface of the fruit. The cause of these spots was identified as *Fusicladium* [*Venturia inaequalis*], which had evidently developed in an entirely atypical manner under storage conditions. Very few conidia were formed. The flesh underlying the spots was not involved, but the affected fruit (mostly of the Boiken, Beauty of Boskoop, and London Pippin varieties) did not keep nearly as well as sound apples.

'Dust spot', characterized by the formation of dark-grey, indistinctly delimited spots, 1 to 5 mm. in width, covered with minute black dots, was found to be due to a fungus with one- to four-septate, straight or slightly curved spores measuring 8 to 26 by 2·5 to 4 μ, the exact systematic position of which within the Sphaeropsideae could not be determined. This disturbance is hardly more than a blemish, though the unattractive appearance of the fruit naturally reduces its value. The Eckhof's Wilder is the variety chiefly affected.

Plagge (H. H.). **A study of soggy breakdown and some related functional diseases of the Apple.**—*Proc. Amer. Soc. Hort. Sci.*, *1929*, pp. 315–318, 1930.

Some of the more important recent investigations of soggy breakdown [*R.A.M.*, viii, p. 451], with which is included soft scald [ibid., v, p. 499], mealy breakdown [ibid., vii, p. 790], internal browning, and brown heart [ibid., iv, p. 173], are summarized. New data are also given on the effect of delayed storage on soggy breakdown and scald. It was found that susceptibility to the former disorder was highest when storage was delayed from two to five weeks, inclusive, after which there was a very marked decrease; it was much higher at 30° and 32° F. than at 36°. When the apples become no longer susceptible to soggy breakdown, however, they tend to develop scald, the subsequent percentage of which in apples stored after 5 weeks' delay ranged from 5·3 at 30° to 40 at 36°.

Headlee (T. J.), Martin (W. H.), & Farley (A. J.). **1930 spray schedule for Pears.**—*New Jersey Agric. Exper. Stat. Circ.* 223, 3 pp., 1930.

The following treatments are recommended for the control of brown blotch [of undetermined origin], black spot [*Fabraea maculata*], and other fungous diseases and insect pests of pears under average conditions in New Jersey. (1) As the buds are swelling: oil emulsion (for insects only); (2) directly after petal fall: New Jersey dry-mix, plus 3 lb. lead arsenate per 100 galls. of mixture; (3) seven days after petal fall: as under (2); (4) 17 days after petal fall: as under (2). Self-boiled lime-sulphur or a good colloidal sulphur may be substituted for New Jersey dry-mix.

Headlee (T. J.), Martin (W. H.), & Farley (A. J.). **1930 spray schedule for Plums and Cherries.**—*New Jersey Agric. Exper. Stat. Circ.* 221, 4 pp., 1930.

The following treatments are recommended for the control of fungous diseases and insect pests of plums under average conditions in New Jersey. (1) Before the buds swell (for black knot [*Dibotryon morbosum*: *R.A.M.*, ix, p. 116], brown rot [*Sclerotinia americana*], and insects): lime-sulphur 10 in 100; (2) immediately after petal fall (for brown rot and other fungous diseases): New Jersey dry-mix, plus 3 lb. lead arsenate per 100 galls., or a finely divided colloidal sulphur; (3) when the fruit is the size of a small green pea: as under (2); (4) three weeks after (3): New Jersey dry-mix.

Cherries should be treated similarly to plums for the first three applications, against brown rot [*S. americana*], leaf spot [*Coccomyces hiemalis*: ibid., ix, p. 661], and other fungous diseases; three subsequent applications of 1 to 40 lime-sulphur should be given, viz., after the fruit is picked, a fortnight later, and again in three weeks, for the control of leaf spot.

HEADLEE (T. J.), MARTIN (W. H.), & FARLEY (A. J.). **1930 spray schedule for Peaches.**—*New Jersey Agric. Exper. Stat. Circ.* 222, 4 pp., 1930.

The following treatments are recommended for the control of fungous diseases and insect pests of peaches under average conditions in New Jersey. (1) Before the buds swell (for leaf curl) [*Taphrina deformans*]: commercial lime-sulphur 10 in 100; (2) just as the blossom buds show colour (for brown rot) [*Sclerotinia americana*]: New Jersey dry-mix (25 lb. per 100 galls.) or a finely divided colloidal sulphur; (3) just as the husks begin to split from the small fruits (for scab [*Cladosporium carpophilum*], brown rot, and insects): as under (2), plus 2 lb. lead arsenate and 8 lb. high calcium hydrated lime per 100 galls.; (4) a fortnight after (3): as under (3); (5) two to three weeks after (4): New Jersey dry-mix or 80-20 sulphur-lime dust.

ZAZZERI (E.) & ZAZZERI (T.). **Proteggiamo i fruttiferi dai tumori radicali.** [Let us protect fruit trees from root tumours.]—*Rivista Agricola*, xxvi, 587, pp. 230-231, 2 figs., 1930.

After pointing out that crown gall of fruit trees (*Bacterium tumefaciens*) spreads with very great rapidity in Italy, the authors state that an apparently healthy, one-year-old Amaden peach tree developed severe chlorosis three years after transplanting and a large tumour was found about 15 cm. below the soil level. The tumour was cut out and the wound disinfected with a concentrated solution of iron sulphate. Subsequently the tree remained normal up to the eighth year, when it again declined; an enormous tumour was found some 30 cm. below the site of the previous one, while large tumours had also formed on several of the roots and rootlets.

TOGASHI (K.). **Studies on the Valsa diseases of fruit and forest trees.**—*Ann. Rept. Work of Saito Ho-on Kai*, Sendai, Japan, 4, pp. 88-90, 1929. [Received October, 1930.]

Two forms of *Valsa* have been found causing serious damage to peach trees in northern Japan, viz., form A with a conceptaculum at the base of the stroma, closely resembling *V. leucostoma* [*R.A.M.*, iii, p. 433; iv, p. 614; viii, p. 452], and form B without a conceptaculum, the latter producing ascospores nearly twice as large as those of the former. The pycnospores and ascospores of both forms germinate well at a range of 18° to 28° C., the optimum temperature being 18°, except for the pycnospores of A (23°). The minimum, optimum, and maximum temperatures for mycelial growth of form A were found to be 5°, 28° to 30°, and 37°, the corresponding points for B being 5°, 23°, and 30°.

Three distinct morphological forms of *Valsa* were found near Morioka on *Chamaecyparis obtusa*, one each on *C. pisifera*, *C. pisifera* var. *plumosa*, and *Thuja standishii*, and two on *T. orientalis*.

TOGASHI (K.). **Studies on the Valsa diseases of fruit and forest trees (Report II).**—*Ann. Rept. Work of Saito Ho-on Kai*, Sendai, Japan, 5, pp. 139-142, 1929. [Received October, 1930.]

Aversion was observed between *Valsa* form A [*V. leucostoma*: see preceding abstract] and *V.* form B grown on the same plate,

and also between different strains of the same form. This phenomenon cannot, therefore, always be used as an indication of specific differentiation [cf. *R.A.M.*, iii, p. 471]. Inoculation tests showed that both forms are pathogenic to peaches, nectarines, and apricots (*Prunus armeniaca* var. *ansu*); slight infection was also produced by both on *P. yedoensis*, while B attacked *P. mume* and A was slightly pathogenic to plums (Golden Sugar). Form A, being adapted to a wider range of temperature than B, is generally distributed, the latter being restricted to the northern districts of Honshu and Hokkaido. Gummosis is a constant feature of *Valsa* infection, the critical period for which in the region of Morioka extends from the middle of August to early November.

TOGASHI (K.). **Morphological studies of Leucostoma leucostoma and Valsa japonica, the causal fungi of canker or die-back disease of Peach trees.**—*Bull. Imper. Coll. Agric. and Forestry*, Morioka, Japan, xiv, 50 pp., 4 pl., 1930.

The writer's studies on canker or die-back of peach trees in the vicinity of Morioka, Japan, have shown that both *Valsa leucostoma* [see preceding abstracts] and *V. japonica* [ibid., iii, p. 433; iv, p. 614], the cause of a canker of cherry trees, are implicated in the etiology of this disease. In this paper the morphology of these fungi is fully discussed, and the biometrical data relating to each, as well as to the allied *V. ambiens* [loc. cit.], are presented in 31 tables.

The stromatic development of *V. leucostoma* is characterized by a differentiated cap of ectostromatic mycelium, composed of slender, hyaline, prosenchymatous hyphal cells covering the young stromatic parts of parenchymatous coloured cells. This cap, which is absent in *V. japonica*, is considered sufficiently distinctive to constitute a generic difference, and the fungus is referred to the genus *Leucostoma* (Nitschke) v. Hoehn. The pycnospore dimensions of *L. leucostoma* were found to fluctuate according to the season, length and variability being greatest during the period from August to October. The dimensions of the asci and ascospores both of *L. leucostoma* and *V. japonica* are largest during the late winter and early spring. The peach strain of *V. japonica* frequently produces less than eight spores in an ascus, a few of which remain sterile.

A two-page bibliography is appended.

TOGASHI (K.). **Comparative studies on the physiology of Leucostoma leucostoma and Valsa japonica.**—*Bull. Imper. Coll. of Agric. and Forestry*, Morioka, Japan, xv, 76 pp., 1 pl., 3 graphs, 1930.

This comprehensive comparative study, accompanied by 43 tables, of the physiological characters of *Leucostoma leucostoma* and *Valsa japonica* [see preceding abstract], leads the writer to conclude that the peach and cherry forms of the latter fungus are closely related. On the other hand, *L. leucostoma* from peaches in Japan was found to be distinct from the plum strain of the same fungus from England, as well as from *Cytospora prunorum* from Holland.

The pycnospores and ascospores of *V. japonica* germinate best at 18° to 28° C. (optimum temperature 18°); the minimum and maximum temperatures for growth are 5° and 32°, respectively, with an optimum between 23° and 25°. The optimum hydrogen-ion concentration both for *V. japonica* and *L. leucostoma* is P_H 5·6 to 5·8. The pycnospores of *L. leucostoma* are killed by 90 minutes' exposure to a temperature of 50° and 30 minutes to 55°, while those of *V. japonica* are destroyed by over 15 minutes at 50° and by 4 hours at 40°.

A six-page bibliography is appended.

STEVENS (N. E.) & MOOK (P. V.). **Field observations on Strawberry dwarf in North Carolina.**—*Phytopath.*, xx, 8, pp. 669–672, 1930.

An account is given of strawberry dwarf [*R.A.M.*, vii, p. 651], which has recently been shown by Brooks (*Florida Agric. Exper. Stat. Bull.* 204, 1929) to be due to a nematode (probably *Aphelenchus fragariae* [ibid., vii, p. 650] or a closely allied form).

ARNAUD (G. & M[ADELEINE]). **La pourriture des Fraises et les Phytophthorées.** [Strawberry rot and species of *Phytophthora.*]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 349–351, 1 pl., 1930.

A brief account is given of a rot of strawberries which was first observed in 1928 at Chevreuse [Seine-et-Oise], and the symptoms of which were strongly reminiscent of the leather rot of strawberries in America attributed by Rose to *Phytophthora cactorum* [*R.A.M.*, iv, p. 100]. The same rot again occurred in 1930, and the causal organism, which was particularly prevalent during June, was found to be a species of *Phytophthora*. The character of the rot varies with the stage of maturity of the fruit when infected; in immature berries the infected areas remain hard, turn green or dark brown, and tend to dry up, while ripe berries become soft and the bright red ones turn a milky pink. Some of the diseased berries developed a repellent bitter taste, while this bitterness was absent from others which were definitely shown to be infected with the fungus.

The mycelium inside the affected tissues is non-septate, cylindrical or varicose. Conidia develop on the infected fruit sparsely, even when kept for some time under moist conditions; they are of the shape usual in species of *Phytophthora* of the *omnivora* type, are borne on flexuous, undifferentiated hyphae, and are remarkable by the prominence of the apical papilla. Some of the rotted berries showed an abundance of oospores presumably belonging to the same fungus; all the oogonia had exclusively paragynous antheridia. Fully developed oospores have a double wall, and their diameter is about 28 μ.

BARTHELET (J.). **Le mildiou du Groseiller, Plasmopara ribicola Schroet.** [Gooseberry mildew, *Plasmopara ribicola* Schroet.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 7, pp. 352–355, 1 pl., 2 figs., 1930.

In 1930, a year of frequent rain and relatively high temperatures, uncultivated red currant (*Ribes rubrum*) bushes occurring

in the undergrowth of the woods near Versailles and Meudon were severely attacked by the mildew, *Plasmopara ribicola*. Owing to the favourable meteorological conditions, the fungus affected practically the whole of the foliage of the red currant bushes, while in normal years the attack is usually limited to the leaves closest to the soil. On the upper surface, the leaf spots are at first yellow, becoming later brown and rapidly drying up; on the lower surface they are covered with a greyish-white conidial efflorescence. The leaves soon die and fall off, leaving the bushes practically defoliated.

The leaf tissues are permeated by a non-septate mycelium, at first hyaline and later brown, furnished with globose appressoria, 8 to 10 μ in diameter. The conidia are hyaline, papillate at the apex, 27 by 20 μ in diameter, and are borne on erect conidiophores emerging in tufts of 3 to 7 from the stomata. In the leaves still attached to the bushes a small number of the apparently previously undescribed oospores of the fungus were found; they were smooth, globose, 30 to 40 μ in diameter, with walls 4 to 5 μ thick, and remain enclosed in the oogonial envelope.

The fungus has never been seen to attack cultivated varieties of red currants in the same neighbourhood, and attempts to inoculate it into other species of cultivated *Ribes* invariably gave negative results. This is believed to be due to the different conditions under which cultivated currants are grown, since the fungus apparently requires a high degree of humidity for its development, such as is found in the dense undergrowth of woods.

COUSINS (H. H.) & SUTHERLAND (J. B.). **Plant diseases and pests. Report of the Secretary of the Advisory Committee on the Banana Industry.**—*Ann. Rept. Dept. of Sci. and Agric. Jamaica for the year ending 31st December, 1929*, pp. 15–19, 1930.

After stating that the total number of infections by Panama disease [*Fusarium cubense*] encountered in Jamaica during 1929 amounted to 53,024 and involved 87,513 diseased plants, as compared with 29,875 infections involving 54,109 plants in 1928 [*R.A.M.*, viii, p. 631], the authors give a summarized account of the experiences of the Department of Agriculture in regard to this disease since 1912, and cite very numerous instances to illustrate the intractable nature of the disease once it appears in a plantation.

The treatment adopted consisted in isolation by the removal of all contact plants for a distance of one chain from the diseased banana [ibid., v, pp. 63, 654; vi, p. 42], but with the extension of the disease in any locality a gradual reduction in this distance is now permitted to the 'nine root' system, of 16 ft. radius, by which eight healthy plants surrounding an affected one are removed and destroyed. Experience has demonstrated that this relaxation of the preventive measures has increased both the incidence of Panama disease and its rate of spread, but it possesses an immediate economic advantage, and is legally sanctioned though the approval of the Director of Agriculture is necessary before the nine root treatment may be adopted.

During the past 18 years many hundreds of planters in Jamaica have tried to control the disease by treating and eradicating the diseased plant only, but owing to the chain-action by which *F. cubense* spreads rapidly in the soil from plant to plant this 'one-root' method has in all cases failed to check a catastrophic spread of the disease, relatively large areas of bananas so treated being lost in some cases in eighteen months after the discovery of the first infection. The authors consider that the adoption of this method has resulted in the disease being at least ten times as severe as it would have been had wiser counsels prevailed.

Samples of poor and rich soil, of well and badly drained soil, of alkaline, neutral, and acid soils were sterilized with high-pressure steam *in situ* in large concrete vessels, healthy suckers of the Gros Michel banana being planted in each and inoculated with *F. cubense.* Duplicate samples of alkaline, neutral, and acid soils remained uninoculated. After five months' growth all the inoculated plants succumbed to the disease, though the controls remained healthy. This result confirms 18 years' field experience in Jamaica, which has demonstrated that good cultivation, drainage, and a high or low P_H value of the soil are powerless to prevent the spread of Panama disease once infection has become established [ibid., viii, p. 797].

The supposition that *F. cubense* travels through the soil in the absence of the banana plant and thus renders quarantine precautions futile is considered to be untenable since plots exist where the disease was treated 15 years ago and where healthy bananas still surround the original quarantine areas.

Forty acres of land abandoned in 1922 on account of Panama disease were replanted with the Jamaica banana in 1927. The initial infection was less than 3 per cent. One-root treatment was carried out and each diseased Gros Michel was replaced by an immune variety. During the first two years of the experiment, of the original 14,000 plants no fewer than 9,711 developed the disease. The land produced only one-third of a crop and was commercially unprofitable as a source of Gros Michel bananas.

WARDLAW (C. W.) & McGUIRE (L. P.). **The behaviour and diseases of the Banana in storage and transport.**—*Trop. Agriculture*, vii, 7, pp. 183–189, 1930.

In banana storage trials at the low temperature station, Trinidad, the losses caused by the rotting of banana bunches progressing from the cut end of the main stalk usually known as stem-end rot [cf. *R.A.M.*, viii, p. 256; ix, p. 789], but referred to in the present paper as main-stalk rot, were almost negligible, though an alarming amount of wastage was due to this condition in commercial cargoes. Cutting the stems with a sharp knife and smearing with ordinary laboratory vaseline [ibid., ix, p. 729] gave good control. The disease was associated with *Thielaviopsis* [*Ceratostomella*] *paradoxa*, *Botryodiplodia theobromae*, and *Gloeosporium musarum*; other fungi isolated during the tests included *Phomopsis* sp., *Acremoniella* sp., *Eidamia* sp., *Verticillium* sp., and *Fusarium* spp., together with various unidentified organisms.

Local lesions along the main stalk, sometimes leading to spread-

ing blemishes or cracks, were caused by *C. paradoxa*, *G. musarum*, and *Phomopsis* sp. *G. musarum* in some cases caused cushion infections extending to the finger-stalks and fingers, with dropping of the latter, while the spread of the fungus to the fingers sometimes produced disease on the fruit skin.

The small amount of disease that developed in the storage trials as compared with that present in commercial cargoes was due to the fact that whereas the interval between reaping and the commencement of refrigeration after closing the hatches and blowing out the air for one hour was, under commercial conditions, about 36 hours, this interval in the storage trials seldom reached 10 hours. A further cause of disease is the rather slow cooling down of the cargo to the regulation 53° F. during the first four days of the voyage. Seventy hours after the beginning of refrigeration on one boat the average flesh temperature of the fruit was 60·2°, whereas at the station considerably lower flesh temperatures were obtained within 48 hours.

A consignment of bananas was placed under transport conditions of cooling, the stem-ends being cut and inoculated with either *C. paradoxa* or *B. theobromae* taken from diseased stem-ends obtained on the boat. The fruit was then left in the laboratory at ordinary temperatures for 36 hours, then kept successively for 24 hours at 70°, 48 hours at 60°, and for the rest of the normal voyage period at 53°. Before the end of the period at 60°, characteristic stem splitting became apparent in the fruit inoculated with *B. theobromae*, and by the tenth day *C. paradoxa* had reached the centre of the bunch.

The financial loss accruing from main-stalk rot would be considerably reduced by the application of the vaseline treatment. When a bunch has been finally passed for shipment at the quay the stem-ends should be cut with a sharp knife and thoroughly vaselined. Also, within not more than 12 hours after the fruit has been placed in the refrigerators the fans should be delivering air at 53°.

The stationary spray plant.—*Fruit World of Australasia*, xxxi, 3, p. 109; 5, pp. 179–180, 1 diag., 1930.

After referring to the advantages of the electrically driven stationary spraying plants used in many American orchards [cf. *R.A.M.*, ix, p. 791], the author points out that, in 1925, 325 stationary plants (of which 83 per cent. were electrically driven) were sold in the Wenatchee district in Washington State, as against 18 portable plants. More than one half of the 3,000 apple growers in this locality are estimated to use fixed plants; nearly every one of which, where possible, is electrically operated.

A 5 h.p. plant is suitable for orchards of 15 to 30 acres. A good spray gun with a one-eighth inch orifice delivers about 5½ galls. per minute under 300 lb. pressure, and tests made in America showed that, allowing an average application of 3 galls. per tree, about 4 acres could be covered in one day by one man and a boy assistant. Under Australian conditions the capital cost for a 25-acre installation is estimated at £320.

Details are given of the construction and working of the

various parts of the plant and of the pipe system and method of laying it.

MARTIN (W. H.) & CLARK (E. S.). **Influence of Bordeaux mixture on transpiration.**—*Fiftieth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 249–255, 2 graphs, 1929. [Received October, 1930.]

The application of 5–5–50 Bordeaux mixture to potatoes was found to result in an increase in transpiration rates [cf. *R.A.M.*, ix, p. 258]. In soils adjusted to 15, 30, and 50 per cent. moistures increased water loss occurred during the night following spraying with Bordeaux mixture, especially in the case of the higher moisture contents. During the day increases were observed in the 50 and 30, but not in the 15 per cent. moisture series.

STAPP (C.). **Die Wirkung von Alkylresorcinen auf pflanzenpathogene Bakterien.** [The action of alkyl resorcins on phytopathogenic bacteria.]—*Angew. Bot.*, xii, 4, pp. 275–289, 1 fig., 1930.

The results of the writer's experiments [which are tabulated and discussed] on the bactericidal action of phenylethylresorcin and hexylresorcin at varying concentrations indicated that their effects are largely dependent not only on the degree of sensitiveness of the bacteria but also on the type of medium in which the latter are cultivated [cf. *R.A.M.*, viii, p. 392]. It was found, in general, that *Pseudomonas* [*Bacterium*] *tabacum* [see below, p. 61], *P. syringae* [ibid., viii, p. 635], and *P. savastanoi* [ibid., vii, p. 726 *et passim*], were much more resistant than *Bacillus phytophthorus* [ibid., ix, p. 484], *B. carotovorus* [ibid., ix, p. 528], *P.* [*Bact.*] *tumefaciens* [loc. cit.], *P. hyacinthi* [ibid., viii, p. 245], and *Bact. sepedonicum* [see below, p. 51], the degree of resistance varying with the medium used (bouillon, potato, or carrot agar for solid media and bouillon, or expressed juice of carrot or potato for liquids). A test in which potato tubers inoculated with *B. phytophthorus* were exposed to the action of hexyl- and phenylethylresorcin indicated that a concentration of at least 0·2 per cent. of the former and of over 0·3 per cent. of the latter would be necessary to inhibit the growth of the organism. Since in the laboratory tests *B. phytophthorus* was killed by both the resorcins at 0·08 per cent., it is evident that no conclusion as to the toxic action of these substances on phytopathogenic bacteria within the host can be drawn by their effect on the same organisms on artificial media.

FULMER (E. I.) & WERKMAN (C. H.). **The chemical action of micro-organisms.**—xiii + 198 pp., London, Baillière, Tindall & Cox, 1930.

In connexion with studies on the production of chemicals from agricultural wastes by the action of micro-organisms, the authors sought to obtain a comprehensive view of the chemicals reported to be produced through the agency of bacteria, yeasts, and moulds on various substrata. The study was limited to the non-nitrogenous compounds which furnish the important sources of energy for the organisms and for the zymotechnical production of chemicals on a

large scale. The results of the bibliographical survey conducted on these lines are presented in three tables in the following order: (1) organism, substratum, product, and authority; (2) substratum, product, organism, and authority; and (3) product, substratum, organism, and authority, The concluding chapter contains a list, covering more than 30 pages, of the references consulted in the compilation.

SHAFIK (M.) & PAGE (A. B. P.). **Control of mites attacking stocks of insect and fungous cultures.**—*Nature*, cxxvi, 3174, pp. 311–312, 1930.

Very satisfactory control of mites infesting cultures of various fungi has been obtained at the Imperial College Biological Field Station, Slough, Bucks, by exposure to carbon tetrachloride at a concentration of 0·5 c.c. per l. for 24 hours [cf. *R.A.M.*, ii, p. 325]. The mites were killed while the fungi were unharmed. Identical results were given by exposure to trichlorethylene for the same time at half the strength.

SCHLUMBERGER (O.). **Saatenanerkennung und Pflanzenschutz im Jahre 1929.** [Seed certification and plant protection in the year 1929.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 7, pp. 53–54, 1930.

During 1929 seed certification was refused in Germany on account of disease as follows: 6 per cent. of the total area under rye inspected (26,062 hect.), compared with 9·9 in 1928 [*R.A.M.*, ix, p. 46] and an average of 4·3 per cent. for the period 1923–27; wheat (19,626 hect.) 30 per cent. (17·7 and 37·1); barley (14,442 hect.) 45·2 per cent. (28·2 and 31·2); oats (23,505 hect.) 12·2 per cent. (4·1 and 28·2); potatoes (42,044 hect.) 62·9 per cent., including varietal irregularities (58·9 and 67·8).

Bunt of wheat [*Tilletia caries* and *T. foetens*] was responsible for the rejection of 2·8 per cent. of the wheat crop, compared with 3·7 per cent. both in 1928 and during the period 1923–27; loose smut of wheat [*Ustilago tritici*] for 0·96 per cent. (0·65 and 1·9); covered and loose smuts of barley (combined) [*U. hordei* and *U. nuda*] for 6·8 per cent. (0·8 and 3·3); loose smut of oats [*U. avenae*] for 1·2 per cent. (0·45 and 2·7); and flag smut of rye [*Urocystis occulta*] for 0·002 per cent. (0·05 during the period 1923–27).

Of the potato crop inspected, 5·7 per cent. was rejected for blackleg [*Bacillus phytophthorus*] compared with 6·9 in 1928; 2·1 for *Rhizoctonia* [*Corticium solani*] (2·3); 0·7 for *Phytophthora* [*infestans*] (2·6); 0·8 for the occurrence of wart disease [*Synchytrium endobioticum*] within a prescribed radius; degeneration and poverty of stand (including virus diseases) 23·4 (15·6); miscellaneous diseases 7 (7·3).

The relative quantities of seed-grain treated by the liquid and dry methods were ascertained as far as possible by means of a *questionnaire*: about 31,698 doppelzentner was disinfected by the former and 12,827 doppelzentner by the latter, representing about three-quarters and one quarter, respectively, of the total area submitted for certification.

STEVENS (F. L.) & RAGLE (MILDRED E.). **The reaction between various races of Sclerotium and other fungi.**—*Trans. Amer. Microscop. Soc.*, xlix, 3, pp. 264–268, 3 figs., 1930.

By growing seven strains of *Sclerotium rolfsii* and four of *S. delphinii* [*R.A.M.*, ix, pp. 38, 529] in the presence of various other fungi on corn meal agar plates, it was possible to detect differences between the strains which would not otherwise be apparent. Keys are given showing the reaction of the various strains to contact with ten different fungi.

KOESLAG (F. D.). **Die Kartoffelanerkennung in Holland.**—*Mitt. Deutsch. Landw.-Gesellsch.*, xlv, 23, pp. 505–508, 1930.

The principles underlying the system of seed potato certification in Holland are explained and the methods of organization defined [*R.A.M.*, viii, p. 805]. Special reference is made to the work of selection with a view to the gradual elimination of the virus diseases.

WHITEHEAD (T.). **A study of the degeneration of certain Potato stocks.**—*Ann. of Appl. Biol.*, xvii, 3, pp. 452–486, 2 pl., 1 fig., 8 graphs, 1930.

A full account is given of trials in 1926 and 1927 at the University College Farm near Bangor, North Wales, for the purpose of studying the factors which affect the rate of degeneration, as measured by reduction in yield, of certain varieties of potato cultivated in one locality for a number of years without change of seed [*R.A.M.*, ix, p. 552]. The varieties used were Kerr's Pink and Great Scot grown at the Farm for one to six years in succession, the seed of which was divided into three classes by size, corresponding to the commercial descriptions 'ware', 'seed', and 'chats', each of which was sown separately in chequerboard plots, their yields being then compared with that of seed freshly received from Banffshire, Scotland.

It was found that in all three classes of both varieties the yield progressively declined from the youngest to the oldest stocks, with the exception of that grown for six years, which compared favourably with slightly younger stocks. With the same reservation, the percentage of plants showing symptoms of virus diseases decreased from the oldest to the youngest stocks. The relative superiority of the six-year-old stocks is considered to be attributable to the exceptional freedom from disease of the original seed when received from Scotland and to local conditions of spread of the disease at the College Farm which tended to maintain any original difference in infection between stocks. The percentage of 'misses' also increased progressively from the younger to the older stocks, this being ascribed to prolonged home-saving of the seed, and probably, though not certainly, to virus infection. Statistical evaluation of the relationship between virus infection and loss in yield showed it to be a linear correlation of an extremely high order, namely $0{\cdot}83 \pm 0{\cdot}046$ in the case of Kerr's Pink and $0{\cdot}97 \pm 0{\cdot}008$ in that of Great Scot.

There was no clear evidence in either variety of any marked reduction in the size of the tubers produced attributable to virus

infection, but definite evidence was found that the proportion of large tubers in the crop is affected by the size of the seed tuber. The latter did not appear, however, to affect the rate of degeneration, with the possible exception of the oldest stocks of Kerr's Pink. In this variety there was no significant difference in virus infection in the three tuber classes, irrespective of the length of time they had been grown locally; this also applies to Great Scot, so far as leaf roll is concerned, but the 'chats' gave a higher percentage of mosaic and crinkle plants than the 'ware'.

In marked contrast to the degeneration at College Farm, no reduction of vigour was observed in Kerr's Pink and Great Scot grown for six consecutive years at Madryn Castle Farm Institute, some thirty miles distant, where, probably owing to climatic and topographical factors, aphids occur sparsely. Seasonal factors also, by influencing the rate of breeding of insect vectors and the vigour of the potatoes, may considerably accelerate or retard the degeneration of a partially infected stock. The influence of variety on the rate of degeneration was found to be the resultant of three distinct forms of susceptibility, namely, liability of the haulms to infection, liability of the tubers to become infected from the haulms, and the effect of infection on the yield.

WHITEHEAD (T.). **Transmission of Potato leaf roll.**—*Nature*, cxxvi, 3172, pp. 241–242, 1930.

The writer briefly replies to Dr. K. Smith's objections regarding the utility of *Myzus circumflexus* in the transmission of potato leaf roll [*R.A.M.*, ix, p. 801]. The occasional absence of dorsal markings may, it is true, complicate the detection of apterous females of this species, but a similar criticism is applicable to other unmarked species, e.g., *M. persicae*. The suggestion that *M. circumflexus* possesses a salivary toxin liable to produce a false mosaic in Solanaceous plants requires careful investigation. If substantiated, this knowledge would mark a definite advance in the study of virus diseases, and would naturally restrict the use of *M. circumflexus* to special aspects of mosaic transmission, though it would not, in the writer's opinion, invalidate the efficacy of this insect in leaf roll transmission studies.

SALAMAN (R. N.). **Virus diseases of the Potato: streak.**—*Nature*, cxxvi, 3172, p. 241, 1930.

The results of recent investigations at the Potato Virus Research Institute, Cambridge, are stated to point to the existence of at least two distinct viruses producing potato streak [*R.A.M.*, ix, p. 481], which may be differentiated, as in the case of crinkle 'A' and paracrinkle [ibid., ix, p. 603], by their varietal reactions.

Two out of three apparently healthy and vigorous Di Vernon stocks, grafted on healthy Arran Victory plants, produced in the latter only a mild mosaic, but when grafted on healthy Presidents they caused a violent and lethal streak. Moreover, when the mosaic diseased Arran Victory plants are grafted on to President, the latter contracts an acute form of streak just as in the case of direct grafting from Di Vernon.

All the Up-to-Date potato plants examined (with one doubtful

exception) were found to be carriers of streak, but the form of the disease carried by this variety reacts differently from that harboured by Di Vernon. In the case of grafting with Up-to-Date, both the healthy test plants (Arran Victory and President) develop a moderate and generally non-lethal form of streak, the former being the more severely affected. Kerr's Pink and Majestic are also carriers of the same type of streak as Up-to-Date. The first-named variety exerts a depressing effect on the virus, so that its reaction on grafting to other varieties is seldom in terms of streak. In Majestic the occurrence of streak carriers is rather rare.

A corresponding difference of reaction is observed when *Datura* [*stramonium*] is inoculated with the two types of streak, the Di Vernon carriers producing no symptoms while those of Up-to-Date and Kerr's Pink cause a reaction identical with that following inoculation with crinkle 'A'.

It is suggested that the virus which may be latent in Up-to-Date, Kerr's Pink, and Majestic and which produces streak in healthy Arran Victory and President be termed streak 'A', while that which may be latent in Di Vernon, causing streak in healthy President but not in Arran Victory, be known as streak 'B'.

Goss (R. W.). **The symptoms of spindle tuber and unmottled curly dwarf of the Potato.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 47, 39 pp., 7 pl., 1930.

After reviewing the descriptive literature dealing with potato spindle tuber and unmottled curly dwarf [*R.A.M.*, ix, p. 630] the author gives a detailed account of investigations made to compare the symptoms of the two diseases on Bliss Triumph potatoes under various environmental conditions.

Owing to the variation in the symptoms shown by different varieties and even individual plants there is an overlapping of symptoms which frequently renders it impossible to make an accurate diagnosis from published descriptions. Both conditions have probably at times been confused under the name spindle tuber, unmottled curly dwarf having been regarded as a severe form of the other disease [cf. ibid., v, p. 625].

In the author's numerous tests inoculation with the juice of unmottled curly dwarf plants in no instance gave rise to spindle tuber, nor did the reverse ever occur. No evidence was obtained that the virus of spindle tuber can be modified to produce unmottled curly dwarf.

When portions of infected tubers were planted in a greenhouse at approximately monthly intervals from November to February in soil with an optimum moisture content there was little effect on the spindle tuber symptoms; the unmottled curly dwarf tubers planted in December and January produced plants quite similar to the spindle tuber ones, but those planted in February developed much more severe symptoms, being larger, more erect, and with a much more pronounced ruffling and twisting of the leaves.

It was impossible accurately to diagnose all cases of spindle tuber in the greenhouse from the vine symptoms alone; the tuber symptoms were usually distinct, the eye characters and the marked decrease in colour being the most evident. In the greenhouse the

leaves were smoother and often more pointed than is normal, with a tendency to roll downwards. The blossoms of spindle tuber and unmottled curly dwarf plants were more conspicuous and developed earlier in the greenhouse than in the field; sometimes infected plants blossomed in the greenhouse when only 6 to 8 in. high.

Under conditions of high soil moisture content or temperature the tuber symptoms of both diseases become more severe. The vine symptoms of spindle tuber were obscured by the luxuriant growth made, but the tuber symptoms became more noticeable. The same general effect was produced with unmottled curly dwarf, but both vine and tuber symptoms were more severe than those shown by spindle tuber plants. Healthy tubers grown with a high soil moisture content showed more resemblance to spindle tuber than did infected ones grown in a low moisture content. High soil temperatures increased the severity of the vine symptoms in both diseases.

Seed treatments designed to hasten sprouting obscured the retardative effect of the diseases but did not modify the vine and tuber symptoms.

Affected tubers kept in closed containers had a low respiration rate; under conditions detrimental to healthy tubers the rest period of infected tubers was shortened and sprout development stimulated.

The vine and tuber symptoms (with indications of their relative diagnostic importance) of both diseases are tabulated. The modifications in the symptoms brought about by the environmental factors tested was so great as to make it impossible to distinguish accurately between the diseases or between healthy and diseased vines and tubers when produced under dissimilar conditions. To distinguish between spindle tuber and unmottled curly dwarf the plant characters as a whole must be studied. The most constant symptoms were the eye characters, which were less subject to environmental influence than was the shape of the tuber. They were of much value in serving to distinguish diseased from healthy tubers, but in themselves they were insufficient to separate the diseases.

STAPP (C.). **Beiträge zur Kenntnis des Bacterium sepedonicum Spieckerm. et Kotth., des Erregers der 'Bakterienringfäule' der Kartoffel.** [Contribution to the knowledge of *Bacterium sepedonicum* Spieckerm. et Kotth., the causal organism of 'bacterial ring rot' of the Potato.]—*Zeitschr. für Parasitenkunde*, ii, 5, pp. 756–823, 25 figs. (6 col.), 1930.

This is a comprehensive account, accompanied by 16 tables, of the morphological, cultural, and physiological characters of *Bacterium sepedonicum*, the causal agent of bacterial ring disease of potatoes in Germany [*R.A.M.*, viii, p. 288], together with extensive observations, based on laboratory, greenhouse, and field experiments, of its pathogenicity to potatoes and other plants.

The cultural and morphological data presented by Spieckermann and Kotthoff are supplemented and partially emended by the observation that *Bact. sepedonicum* shows an extremely strong tendency to morphological variation, besides storing volutin in its cells as a reserve material and slowly liquefying gelatine.

Parallel studies of *Bact. sepedonicum* and *Aplanobacter michiganense*, the organism responsible for tomato canker [ibid., ix, p. 498], revealed a marked cultural and physiological similarity, extending in a measure also to the morphological characters of the two bacteria, but there was no question of identity.

The colour of *Bact. sepedonicum* cultures on and in the standard nutrient media is pure white or cream, while that of *A. michiganense* is pale yellowish to deep cadmium yellow, these differences being particularly noticeable in milk. The optimum temperature for the development of the former organism is 20° to 23° C., compared with 24° to 28° for the latter, the minima for the two bacteria being 4° and below 0°, respectively. *Bact. sepedonicum* was found to be more sensitive to heavy doses of carbon compounds, e. g., glucose and glycerine, to salts (ammonium chloride, potassium nitrate, and the like), and to hydrogen-ion concentration, than *A. michiganense.*

Under the conditions of the author's experiments *Bact. sepedonicum* retained its viability for a maximum period of 1½ years. It was capable of overwintering in potato leaves and tubers in the soil, losing none of its viability or pathogenicity as a result of unfavourable conditions. All the potato varieties tested, including Kuckuck, Wohltmann, Deodara, Phoenix, Tannenberg, Weisse Riesen, Heimat, Preussen, Blücher, Allah, Juli, and Up-to-Date proved susceptible to infection both in the foliage and the tubers. The tuber rot induced by this organism was of a soft, pulpy, but not slimy consistency, the pulp having a slightly higher hydrogen-ion concentration than that of the healthy tissue.

Artificial inoculation experiments with *A. michiganense* (a culture received from London) gave negative results on potato shoots, but this organism proved weakly pathogenic to the tubers under similar conditions. Both *Bact. sepedonicum* and *A. michiganense* were slightly pathogenic to peas and beans (*Phaseolus vulgaris*) but failed to produce infection in *Vicia faba, Soja hispida* [*Glycine soja*], and *Pelargonium zonale. Bact. sepedonicum* caused some degree of infection on tomatoes, but the symptoms were not nearly so pronounced as those due to *A. michiganense,* the characteristic stem cavities and dark discolorations, for instance, being entirely absent.

In plants growing in the field during four years' experiments in the Mark Brandenburg on sandy soil with a slight admixture of clay, external symptoms sufficiently characteristic to enable a sure diagnosis to be made that the plants were infected by *Bact. sepedonicum* could not be detected. Ring-diseased seed tubers did not uniformly produce diseased daughter tubers. Even when the aerial parts of the plant showed bacterial rotting the daughter tubers were not always diseased, and where infection occurred among the daughter tubers, only a certain proportion of the latter were generally involved. Artificial inoculation of the mother tubers under field conditions resulted in a maximum infection of 36·4 per cent. of the total number of daughter tubers. Infection was found to pass from plant to plant in the field, even at a distance of 1 m. apart. Negative results were given by inoculation experiments with *A. michiganense* on potato tubers in the field, indicating that

the danger to the German potato crop from the newly introduced tomato parasite is negligible.

SCHLUMBERGER [O.]. **Die neuen krebsfesten Kartoffelsorten.** [The new wart-immune Potato varieties.]—*Deutsche Landw. Presse*, lvii, 12, pp. 157–158, 1930.

Notes are given on some of the newly developed potato varieties found immune from wart disease [*Synchytrium endobioticum*] in the latest German official tests, and enumerated in a recent leaflet of the Plant Protection Service [*R.A.M.*, viii, p. 522]. The total number of such varieties is now 90, of which 14 were added to the list during 1929. One of the most promising new substitutes for the susceptible Industrie is Modrow's Blaupunkt, while the previously tested Ackersegen and Erdgold have maintained their good reputation. Encouraging results have again been obtained with Sickingen as a substitute for Wohltmann.

MÜLLER (K. O.). **Über die Phytophthoraresistenz der Kartoffel und ihre Vererbung. (Zugleich ein Beitrag zur Frage der Polyploidie bei der Kartoffel.)** [On the *Phytophthora* resistance of the Potato and its inheritance. (Together with a contribution to the question of polyploidy in the Potato).]—*Angew. Bot.*, xii, 4, pp. 299-324, 1 fig., 2 graphs, 1 diag., 1930.

In 1926 five plants of each of 115 potato varieties derived from crosses between South American and cultivated strains were planted out at Berlin-Dahlem. The population comprised varieties approximating to the cultivated types in their reaction to late blight (*Phytophthora infestans*) as well as those corresponding in this respect to the so-called 'W' strain parent (resistant lines resulting from a cross between a cultivated and wild strain) [*R.A.M.*, viii, p. 196]. The plants were grouped, on the basis of field and greenhouse tests, in seven classes ranging from fairly heavy infection to virtual immunity. Six varieties fell in the last class, while 50 showed only slight infection ; one exhibited fairly heavy infection and the remainder were intermediate.

The date of maturity or dying-off was found to be about the same in both the resistant (plants showing no infection 12 to 15 days after inoculation) and susceptible (plants having an incubation period of 3 to 10 days) groups. However, the premature dying-off of the susceptible varieties in 1929 and the relative longevity of the 'W' strains is considered to be definitely attributable to their respective reaction to *P. infestans*. The host does not afford optimum conditions of development to the parasite until it reaches a certain degree of maturity.

It is apparent from the data obtained in the examination (extending over a three-year period) of 15,000 individuals for *Phytophthora* resistance that in a cross between a resistant and a susceptible variety at least one of the parents was heterozygous for this character, since the F_1 generation was not uniform but segregated into susceptible and resistant strains (about half of each). More than two genes are involved in the production of resistance, since the F_1 and F_2 plants hitherto tested segregated in more than one ratio. The resistant F_1 and F_2 plants consistently

produced over 50 per cent. of resistant progeny (100 per cent. in one case), whereas the susceptible plants always produced under 50 per cent. (none in one instance). The mode of inheritance of resistance to late blight rests, therefore, on a Mendelian basis.

It was found that the ratio of resistant to susceptible plants was near 1 : 35, a relation which is only possible in tetraploid organisms (having four chromosome complexes in the zygophase). The ratios observed indicate that a series of at least four factor pairs participates in the development of *Phytophthora* resistance. The incubation period of the susceptible individuals within one selfed family was found to range from 3 to 6 days, and at least three sub-groups were distinguishable within the susceptible group. Thus there are at least four types (counting the resistant) of reaction to *P. infestans*. At least four allelomorphic genes, therefore, must be involved in the development of resistance to late blight, which is manifested only when the joint action of these four genes reaches a certain critical point; below this degree the fungus is able to make normal growth and the plant is consequently susceptible.

PETHYBRIDGE (G. H.) & SMITH (A.). **A watery wound rot of the Potato.**—*Journ. Min. Agric.*, xxxvii, 4, pp. 335–340, 2 pl., 1930.

The authors give a description of a watery wound rot which was observed causing serious damage in 1929 to harvested potatoes in England. The rot appeared to start invariably from a wound or an abrasion of the skin of the tuber. Externally the chief symptom was a dark discoloration and moistness of the skin over the diseased parts, which were often separated by a dark, sometimes almost black line from the healthy region. The internal decay is sometimes fully indicated by the outward appearance of skin, but in other cases it may involve practically the whole of the tuber with only one or two small external lesions. Not infrequently the skin over the decayed portion is stretched flat and taut, owing to the internal shrinkage of the rotten tissue, and when it becomes split, a considerable quantity of a thin, watery liquid gradually exudes. When a diseased tuber is cut open, the colour of the decayed tissue varies from a slight discoloration, when air had not gained access to the tissues, to greyish, then brown, and finally almost black, with sometimes a slight pinkish tinge in it. The rotten tissue is quite pulpy and at first gives off a slight fishy smell.

Isolations from diseased tubers consistently yielded a fungus which in all essential features agreed with *Pythium de Baryanum*, with the exception that no zoospores were observed. When inoculated into healthy tubers, it readily and rapidly rotted them, the progress of the rot being much more rapid in an incubator at 22° C. than at room temperature. The fungus was found to be incapable of penetrating the undamaged skin of the tubers.

MARTIN (W. H.). **Sweet Potato disease studies.**—*Fiftieth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 256–260, 1929. [Received October, 1930.]

A fair degree of control of scurf [*Monilochaetes infuscans*] in

Yellow Jersey sweet potatoes was given by two organic mercury instantaneous dips (1 in 20), viz., (1) hydroximercurichlorophenol sulphate 6 per cent., hydroximercurinitrophenol sulphate 2 per cent., and inert ingredients 92 per cent. [Bayer dip dust: *R.A.M.*, ix, p. 336], and (2) hydroximercuricresol 12 per cent. and inert ingredients 88 per cent. The standard mercuric chloride treatment (10 minutes' immersion, 1 in 1,000) was also effective.

IKATA (S.) & HITOMI (T.). **On the mode of primary infection through sclerotia and field observations on the basidiospore formation in Hypochnus sasakii Shirai of Rice plants.**—*Journ. Plant Protect.*, xvii, 12 pp., 1 pl., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, p. (33), 1930.]

The sclerotia of *Hypochnus* [*Corticium*] *sasakii* from rice plants [*R.A.M.*, viii, p. 263] are almost exclusively found in the field, where they fall before harvest, an average of 18·3 sclerotia per 30 sq. cm. of ground having been counted. These organs hibernate in the field and infect the following season's rice crop. The formation of numerous basidiospores, apparently not hitherto observed, occurred at night during August and September in the mycelium on the leaves and leaf sheaths.

NAGAI (I.) & HARA (S.). **On the inheritance of variegation disease in a strain of Rice plant.**—*Japan. Journ. of Genetics*, v, pp. 140–144, 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 2, p. (41), 1930.]

A disease characterized by deep reddish-brown, panther-like spots was found to be produced in a Korean strain of rice by *Helminthosporium oryzae* [*R.A.M.*, ix, p. 200]. Seeds from diseased plants gave rise to exclusively diseased progeny. Crosses between healthy and diseased plants produced healthy progeny in the F_1, and healthy and diseased in the ratio of 3 : 1 in the F_2. It is apparent, therefore, that the disease character is recessive.

AMENT (C. C.). **Over den invloed van de zwavelbestuiving op de Rubberproductie.** [On the influence of sulphur dusting on Rubber production.]—*De Bergcultures*, iv, 31, pp. 823–825, 4 graphs, 1930.

On two out of four *Hevea* rubber estates in the Malang district of Java, dusting with sulphur against mildew [*Oidium heveae*: *R.A.M.*, ix, p. 804] resulted in an increased yield of 22 and 14 per cent. over periods of 11 and 12 months, respectively. It is pointed out that these figures should be accepted with a certain reserve, since the less productive parts of the estates were selected as controls in the experiments [full details of which are given].

NIEUWPOORT (D.). **Practisch bestuiven.** [Practical dusting.]—*De Bergcultures*, iv, 32, pp. 838–839, 3 figs., 1930.

In order to overcome certain difficulties connected with the use of the under-carriages of the Björklund and Holder apparatus for dusting against *Hevea* rubber mildew [*Oidium heveae*; see preceding abstract], the writer successfully replaced these by the axle and two wheels of a Chevrolet car. Very satisfactory results have

been obtained with the [volcanic] sulphur sludge of Kawah Poetih, well dried and mixed with a little unslaked lime, which forms a cloud reaching 150 m. through the crowns of the trees. The Niagara dust gun proved efficient in the tests. Three men, with one extra to carry the sulphur, can dust 10 bouws [1 bouw = 0·71 hect.] per hour.

DOPHEIDE (A. B. A.) **De invloed van den meeldauw op de Rubberproductie.** [The influence of mildew on Rubber production.] —*De Bergcultures*, iv, 35, p. 923, 1930.

A severe epidemic of mildew [*Oidium heveae*: see preceding abstracts] occurred in the autumn of 1928 for the first time on the Proempang rubber estate, Java. During the period from October, 1928, to June, 1929, monthly estimates, based on the dry weight of the latex per tapping (alternate day system), were made of the production of the 96 severely infected and 207 slightly diseased or sound trees, compared with the September figures. It was found that on an average the latter outyielded the former by 3·27 gm. per tapping, the decrease in latex production per tree over the nine-month period being 441·45 gm.

LE CLERG (E. L.). **Cultural studies of some soil fungi.**—*Mycologia*, xxii, 4, pp. 186–210, 1930.

Comprehensive notes are given on the cultural characters of 25 fungi occurring in Colorado soils, together with an English diagnosis of each organism.

EMMONS (C. W.). **Coniothyrium terricola proves to be a species of Thielavia.**—*Bull. Torrey Bot. Club*, lvii, 2, pp. 123–126, 1 pl., 1 fig., 1930.

The author states that cultural studies of the species which was recently described by Gilman and Abbot in their summary of soil fungi [*R.A.M.*, vii, p. 57] under the name *Coniothyrium terricola* is in reality an ascomycete of the genus *Thielavia*. It is therefore renamed *T. terricola* (Gilman and Abbot) comb. nov., and a revised description of it is given.

WANN (F. B.). **Chlorosis yellowing of plants: cause and control.** —*Utah Agric. Exper. Stat. Circ.* 85, 11 pp., 1 fig., 1930.

Chlorosis of plants is stated to be widely distributed in Utah, where it is believed to cause heavier aggregate losses than any other single disease. In the majority of cases the condition appears to be due to the lack of available iron in the soil coupled with the presence of abundant quantities of lime. Two methods of control are suggested, namely, the application of iron by spraying with 5 per cent. iron sulphate or the injection of iron salts into the stems [cf. *R.A.M.*, ix, p. 501], and the acidification of the soil by the addition of farmyard manure, ammonium sulphate, or sulphur.

HIGGINS (B. B.). **A Pepper fruit rot new to the United States.**—*Georgia Exper. Stat. Bull.*, 162, 10 pp., 3 pl. (1 col.), 1930.

An account is given of a rot of chilli (*Capsicum annuum*) fruits in the field, which had not been previously recorded in the United

States, and which had been very destructive in some localities of Georgia during 1928 and 1929. The first symptoms appear on the fruits as they turn red in the form of whitish or light pink spots, more or less circular in outline, which may be slightly sunken and in some cases may bear acervuli and scattered clumps of setae of the causal fungus. The latter appears to be identical with *Vermicularia capsici* [*R.A.M.*, vii, p. 678] in India, and its pathogenicity to chilli fruits was proved by artificial inoculations. Observations showed that as the spots develop on the ripening fruits, the mycelium penetrates the central cavity where it comes into contact with the seed, many of which become darkened, indicating the penetration of the seed coats by the fungus. There also was evidence that the mycelium often enters the hilum of the seed without producing any surface discoloration. The fact that the disease is seed borne was further confirmed by experiments in which untreated seed from diseased chillies produced up to 16 per cent. of infected seedlings. Surface disinfection with mercuric chloride, semesan, uspulun, and hot water at 50° C. for one hour was shown not to be a reliable means of control, and it is recommended that no seed from infected chillies should be used for sowing.

LAURITZEN (J. I.) & WRIGHT (R. C.). **Some conditions affecting the storage of Peppers.**—*Journ. Agric. Res.*, xli, 4, pp. 295–305, 1 col. pl., 1930.

The investigation reported in detail in this paper was undertaken following the observation in 1924 of a deterioration of chillies (*Capsicum*) [*annuum*] in cold storage at Washington, D.C., caused by *Botrytis cinerea*. The lesions were circular to elliptical, sharply outlined, and of a creamy to buff olive colour, differing from lesions caused by freezing in that the latter are indefinite in outline, have a water soaked appearance, and are darker green than the normal fruit tissue. Inoculation and cold storage experiments showed that *B. cinerea* is able to attack chillies at temperatures from 0° to 13° C., and there was evidence that infection of cold stored chillies is of common occurrence at temperatures from 0° to 2°, although occasionally there are lots that show little or no infection. The temperature of 4·5°, under the conditions of the tests, was more favourable for infection than either 0° or 10°, and the incidence of infection at each of these temperatures increased with a rise in the relative humidity.

The investigation also showed that chillies contaminated with spores of *Colletotrichum nigrum* [*R.A.M.*, vii, p. 73] developed anthracnose at all the temperatures tested, the incubation period increasing gradually at temperatures below 13° C., but no consistent relation was found between relative humidity and infection with *C. nigrum* at the various temperatures tested.

Although some ripening of the chillies occurred at all the temperatures used, very little occurred in 39 days at 0° and 4·5°, and humidity did not appear to affect the process in any way. The time required for shrivelling to set in increased with the fall in temperature below 13°, and at all the temperatures the number of fruits that shrivelled after any given period of time increased

rapidly with the lowering of the relative humidity. The most favourable cold storage conditions for chillies were found to be a relative humidity of 90 per cent. and a temperature of 0° C., which is sufficiently above the freezing point of the fruits (−1·06°) to safeguard them from freezing injury.

WILSON (J. D.) & RUNNELS (H. A.). **Alternaria blight of Ginseng, preliminary experiments in the control.**—*Ohio Agric. Exper. Stat. Bull.* 142, pp. 11–14, 1 fig., 1930.

Tests made in Ohio during 1928 with various fungicides for the control of *Alternaria panax* [*R.A.M.*, viii, p. 391] on ginseng [*Panax quinquefolium*] showed that Bordeaux mixture (3–4–50) reduced infection to less than 5 per cent. while plots treated with copper lime dusts, ammoniacal copper carbonate, colloidal copper sulphide, and kurtakol yielded at least 50 per cent. diseased plants. Similar results had also been obtained in the previous year.

In 1929 further tests were made, each consisting of four applications of the fungicide made at the following times: (1) when most of the plants were showing above ground, (2) when the leaflets were fully spread, (3) just before blossoming, and (4) just after the fruits were well set. The results were as follows: copper-lime dust (20–80), 84 per cent. diseased; colloidal copper sulphide (4 lb. per 50 galls. of water), 63·7 per cent.; Bordeaux mixture (3–3–50), 2·3 per cent.; the same plus 1 lb. aluminium hydrate, 2·3 per cent.; the same plus 1 lb. fish-oil soap, 2·1 per cent.; the same plus 1 lb. soap and 1 lb. arsenate of lead, 1·7 per cent.; and the same plus 1 lb. soap plus 1 lb. manganar [ibid., ix, p. 734], 1·6 per cent.; while there were 86·4 per cent. infected plants in the untreated control. The addition of the other substances named to the Bordeaux mixture did not significantly affect its efficiency, but the addition of even small quantities of soap greatly facilitated spraying.

KONINGSBERGER (V. J.). **Fidji-ziekte op Java.** [Fiji disease in Java.]—*Arch. voor Suikerind. Nederl.-Indië*, Deel I, xxxviii, 25, pp. 581–584, 2 figs., 1930.

Typical symptoms of Fiji disease [*R.A.M.*, viii, p. 809] are reported to have been observed at the newly established quarantine station of Ranoe Daroengan, Java [ibid., ix, p. 683] on two varieties of sugar-cane imported from the Philippines, viz., C.A. (College of Agriculture) 12735 and C. 147.

In the Philippines the disease is most prevalent on the P.O.J. 2878 and D.I. 52 varieties on newly reclaimed forest soils, similar to that of Ranoe Daroengan. Thanks to the timely establishment of the Java quarantine station, there need be no anxiety regarding the further spread of the disease. The affected canes have been replaced partly by P.O.J. 2878 and D.I. 52 and partly by 'glagah' [*Saccharum spontaneum*]. If the infective principle of Fiji disease is transmitted by the soil, the two highly susceptible varieties will rapidly contract the malady; *S. spontaneum* is reported to be resistant, and on this point also further information is desirable.

It is evident from this experience that serious diseases can be

imported with small consignments of carefully selected material, the origin of which in this case was unimpeachable.

YAMAMOTO (Y.). **Ein Beitrag zur Kenntnis der Gattung Rhizopus. II.** [A contribution to the knowledge of the genus *Rhizopus*. II.]—*Journ. Fac. Agric., Hokkaido Imper. Univ.*, Sapporo, Japan, xxviii, 2, pp. 103–327, 1930.

Continuing his studies on the genus *Rhizopus* [*R.A.M.*, ix, p. 611], the author presents an exhaustive survey, accompanied by 138 tables, of the physiological characters of the species under discussion which were cultured on potato and other media and divided, on the basis of their temperature relations, into five groups, viz., psychrophile, eumesophile, pseudomesophile, euthermophile, and pseudothermophile. To the psychrophile group (no growth at 37° to 38° C.) belong *R. nigricans*, *R. reflexus*, and *R. artocarpi*; to the eumesophile (growth at 37° to 38° but no sporangial development at 15° or 41°), *R. humilis*, *R. albus*, *R. peka* I, and *R. shanghaiensis*; to the pseudomesophile (growth at 37° to 38° and sporangial development at 15° but not at 41°), 13 species, including *R. oryzae*, *R. oryzae* 2, *R. batatas*, *R. delemar*, *R. arrhizus*, and *R. maydis*; to the euthermophile (growth at 37° to 38° and sporangial development at 41° but not at 15°), *R. liquefaciens* and *R. pseudochinensis*; and to the pseudothermophile (growth at 37° to 38° and sporangial development both at 15° and 41°), 11 species, including *R. oryzae* 1, *R. tritici*, *R. nodosus*, *R. peka* II, and *R. chinensis*. All the organisms were killed by 20 minutes' exposure to a temperature of 59° to 61°, but eight (including *R. tritici*, *R. nodosus*, and *R. batatas*) withstood 25 minutes at 58°; *R. reflexus* and three others survived 23 minutes at 54°, while seven others (including *R. nigricans* and *R. artocarpi*) were not destroyed by 16 minutes at 51° to 53°.

The nitrate ion was not used as a source of nitrogen by the species of *Rhizopus* under investigation. Alcohol was formed in cultures on saccharose by *R. artocarpi*, *R. oryzae*, and *R. oryzae* 2. Mycelial growth and sporangial development were generally most profuse on peptone, but in exceptional cases ammonium nitrate stimulated these processes. Twenty-five of the species tested, including *R. oxyzae*, *R. delemar*, *R. batatas*, *R. tritici*, *R. arrhizus*, *R. maydis*, *R. reflexus*, *R. artocarpi*, and *R. liquefaciens*, are described as strong alcohol producers (over 1 per cent). on koji extract. The fungi of the psychrophile and pseudomesophile groups showed the greatest activity in the liquefaction of gelatine. Diastatic activity was most marked at a hydrogen-ion concentration of P_H 5·1 and a temperature of 42° to 45°.

A six-page bibliography is appended.

SOLHEIM (W. G.). **Morphological studies of the genus Cercospora.**—*Illinois Biol. Monogr.*, xii, 1, 84 pp., 4 pl., 1929. [Received August, 1930.]

In this study, over 100 species of *Cercospora* are enumerated with geographical and taxonomic notes and critical observations. The author discusses the history, morphology, and systematic affinities of the genus [cf. *R.A.M.*, iv, p. 570]. Comparative in-

vestigations revealed the existence of four characters on the basis of which it was possible to divide the species into 21 sections, viz., the presence or absence of an external mycelium; conidiophores simple or branched; conidiophores arising from a tuberculate or a loose to fairly compact stroma, or non-stromatic; and conidia acicular-obclavate, abruptly obclavate, or cylindrical.

Indices of hosts and species and a bibliography of over 50 titles are appended.

JOHNSON (E. M.). **Virus diseases of Tobacco in Kentucky.**—*Kentucky Agric. Exper. Stat. Bull.* 306, pp. 289–415, 20 pl., 1930.

This is a detailed and fully illustrated account of the author's investigation of the prevalence, means of transmission, and host range in Kentucky of the virus diseases of tobacco previously described by him in collaboration with Valleau [*R.A.M.*, vii, p. 477], and of eight other virus diseases to which this crop is susceptible. A full description is given of the symptoms of the various diseases, as established in greenhouse inoculation experiments on Turkish tobacco, and also of the symptoms produced by them on Turkish and Burley tobaccos in field inoculations. As used in this paper, the term true tobacco mosaics refers to those diseases of this crop the infective agents of which withstand long periods of drying and seem to affect Solanaceous plants only. The tobacco mosaics determined in this study were severe mosaic types 1 and 2; mild mosaic types 1 and 2; yellow mosaic; white mosaic; and ring mosaic. The other tobacco virus diseases described do not survive in air-dried tissue, and some of them affect plants of other families besides Solanaceae. They are etch, etch +, severe etch, veinbanding (vein margin) [loc. cit.], coarse etch, ring spot, 'healthy potato' virus, and cucumber mosaic types 1, 2, and 3. In addition, the study included two diseases, each caused by a mixture of two viruses, namely, 'healthy potato' virus plus veinbanding ('spot necrosis'), and cucumber mosaic type 3 plus veinbanding, which were originally thought to be caused each by a single virus.

All the above-listed viruses were also tested on tomato, chilli (*Capsicum annuum*), *Physalis heterophylla*, *P. pubescens*, horse nettle (*Solanum carolinense*), Jimson weed (*Datura stramonium*), cucumber, musk melon, pokeweed (*Phytolacca decandra*), eggplant, *Nicotiana rustica*, and apple of Peru (*Nicandra physaloides*), and the symptoms on these hosts are described wherever infection developed. These experiments showed that no apparent change in the properties of each individual virus resulted from its passage through a susceptible host other than tobacco, nor was any change observed in successive passages of the viruses through tobacco. The seven apparently distinct groups of virus diseases revealed were the tobacco mosaics, etch viruses, cucumber mosaics, coarse etch, veinbanding, ring spot, and 'healthy potato' virus.

Inoculations of tobacco plants with juices of naturally infected perennial Solanaceous weeds indicated that many of the viruses capable of infecting tobacco may overwinter in these weeds. There was also evidence that viruses other than true tobacco mosaics are not uncommon in naturally infected tomatoes, chillies, cucumbers,

musk melons, and petunias. In this connexion it is pointed out that as macroscopical identification of the virus diseases which affect tomatoes and chillies in nature is difficult, their determination may be arrived at by inoculation into tobacco, on which the symptoms are usually easily recognizable. The investigation also indicated that the virus disease of common occurrence on pokeweed in Kentucky is not cucumber mosaic or any other virus dealt with in this paper.

Field surveys during three years at Lexington and in Fayette County indicated that Burley tobacco there is affected with the four types of severe and mild mosaics, as well as with etch, etch +, veinbanding, coarse etch, ring spot, and cucumber mosaic type 1. Some of these virus diseases were found to have a greater degree of prevalence in tobacco plantations situated in the vicinity of vegetable and potato fields. Observations indicated that the viruses may be transmitted by insects, among which two species of cucumber beetle (*Diabrotica vittata* and *D. duodecempunctata*), flea beetles [*Epitrix cucumeris* and *Systena elongata*], leafhoppers, and aphids are suggested as probable vectors. White mustard [*Brassica alba*], radish, turnip, pea, bean, rutabaga [*B. campestris*], kale [*B. oleracea* var. *acephala*], and soy-beans were shown not to be susceptible to any of the viruses studied under the conditions of the experiments, but local infections were caused on beet leaves by the cucumber mosaics and 'healthy potato' virus.

The paper terminates with a key for the identification of the virus diseases dealt with.

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1929—30 April 1930.—*Proefstat. voor Vorstenlandsche Tabak, Meded.* 69, pp. 21–40, 4 figs., 3 diags., 1930.

Notes are given on some important tobacco diseases occurring at the Vorstenland Experiment Station (Java) during the period under review, namely, leaf curl; mosaic (the deleterious effect of which on leaf development was statistically demonstrated); slime disease [*Bacterium solanacearum*]; lanas disease (*Phytophthora*) [*nicotianae*], which was well controlled by Raciborski's method of soil disinfection (400 gm. lime and 5 gm. ammonium sulphate mixed with 2 l. of water per 10 l. of heavily infected soil); and mildew [*Erysiphe cichoracearum*: *R.A.M.*, viii, p. 270].

Crotalaria juncea pods were severely infected by a species of *Fusarium*.

STAPP (C.). **Bakterielle Tabakkrankheiten und ihre Erreger.** [Bacterial Tobacco diseases and their causal organisms.]—*Angew. Bot.*, xii, 4, pp. 241–274, 11 figs., 1930.

The objects of the present investigation were to ascertain whether the tobacco disease known in Germany as wildfire [*R.A.M.*, ix, p. 746] is identical with the American bacteriosis of the same name due to *Pseudomonas* [*Bacterium*] *tabacum*; whether the causal organisms of both conditions are identical; and in what respects wildfire differs from the four other recorded bacterial leaf

diseases of tobacco, viz., angular leaf spot (*P. angulata*) [*Bact. angulatum*: ibid., ix, p. 209], Wisconsin leaf spot (*P. mellea*) [*Bact. melleum*: ibid., vii. p. 227; ix, p. 207], black rust (*P.* [*Bact.*] *pseudozoogloeae*) [ibid., vi, p. 444], and white rust (*P.* [*Bact.*] *maculicola*) [ibid., vii, p. 563; viii, p. 120].

Comparative inoculation experiments were carried out with the following strains: ten from infected tobacco (*Nicotiana tabacum*) leaves from the Tobacco Research Institute, Forchheim, Bavaria; one from Plankstadt, Baden; one from Alsatian tobacco; *Bact. tabacum* from a tobacco seedling in Florida; *Bact. angulatum* from tobacco in Virginia; and three from *N. tabacum* in Hungary. Details are given of the cultural characters of these strains and of their reaction to temperature. All were found to be provided with mono- or bipolar flagella, the number of which ranged from 1 to 6 (generally 1 to 3) at each end. Tables are given showing the capacity of the strains for acid production from the various carbohydrates and alcohols and for the assimilation of different sources of nitrogen, together with the results of agglutination and precipitation tests with rabbit sera. No definite conclusion as to the identity or otherwise of the various strains could be reached on the basis of their biochemical reactions. The serological experiments, however, revealed the complete identity of all the strains from Bavaria, Baden, Alsace, and Hungary; no difference could be detected, moreover, between the strains supplied from America as *Bact. tabacum* and *Bact. angulatum*, respectively, whereas *P.* [*Bact.*] *fluorescens* [ibid., v, p. 574], used for comparison, proved to be totally distinct in its serological reactions.

Discussing the evidence for the identity of the various bacterial leaf diseases of tobacco, the author considers that there is little doubt that *Bact. melleum* and *Bact. tabacum* are identical. It was, however, impossible to obtain a strain of the former for experimental purposes. The sole distinguishing characteristic of *Bact. pseudozoogloeae* as described appears to be its reaction to milk and litmus (coagulation with acid formation), and it would therefore seem probable that this organism is also identical with the foregoing. However, since Honing's culture is no longer available, the position of *Bact. pseudozoogloeae* cannot be exactly determined. The knowledge concerning *Bact. maculicola* is so scanty that no comparison can be drawn between this organism (the connexion between which and the 'white rust' disease is regarded as very doubtful) and the other bacteria infecting tobacco. Finally there seems to be no doubt as to the identity of the wildfire and angular leaf spot organisms (*Bact. tabacum* and *Bact. angulatum*). Since in all probability the Wisconsin leaf disease and black rust (*Bact. melleum* and *Bact. pseudozoogloeae*) are both due to the same organism as that causing wildfire and angular spot, it may well be assumed that at least four out of the five supposedly distinct bacterial diseases of tobacco are caused by a single organism to which four different names have been applied.

In a final table the morphological, cultural, biochemical, and physiological characters of the organisms known under the five names given above, as observed by the author or described in the literature, are assembled. A bibliography of 45 titles is appended.

BÖNING (K.). **Beiträge zur Kenntnis des parasitischen Verhaltens von Pseudomonas tabaci Wolf et Foster, des 'Wildfeuer' Erregers am Tabak.** [Contributions to the knowledge of the parasitic behaviour of *Pseudomonas tabaci* Wolf et Foster, the causal organism of Tobacco wildfire.]—*Zeitschr. für Parasitenkunde*, ii, 5, pp. 645–755, 19 figs., 2 diags., 13 graphs, 1930.

This is a comprehensive account, accompanied by 28 tables, of the author's field and greenhouse investigations, conducted at the Bavarian Institute of Agriculture and Plant Protection, Munich, during 1928–9, on the parasitic behaviour of the tobacco wildfire organism (*Bacterium tabacum*) [see preceding abstract].

Meteorological observations confirmed American experience in regard to the necessity of rough, wet weather (especially hail) as a predisposing factor in the development of wildfire. Under these conditions the incubation period ranged from four to nine days, the time elapsing from the appearance of the first symptoms to the climax of the disease varying between six and ten days. The progress of infection was accelerated by cloudy, damp, and mild weather and retarded by dry, sunny conditions, with cool nights. Infection was visible five to eight days after the plants had been inoculated through wounds in dry weather. Early and deep topping were found to be extremely favourable to the development of wildfire, plants subjected to this process losing both in mechanical protection of their upper leaves and their nutritional equilibrium. An excess of nitrogen and a deficiency of potash and phosphoric acid in the fertilizing scheme were found to promote wildfire infection. The most severe attacks occur on leaves the maturity of which is delayed by the fertilizer applied; this is particularly apparent where nitrogen is applied as a top dressing. In field experiments the plants given an excess of nitrogen were heavily damaged, but the injury was partially repaired by the formation of vigorous new shoots. Plentiful supplies of potash seemed to confer an internal resistance which enabled the plants to overcome the effects of the wildfire attack.

Some differences in susceptibility to *Bact. tabacum* were observed among the *Nicotiana tabacum* and *N. macrophylla* varieties tested, but these are considered to be devoid of practical significance. The yellow-flowering *N. rustica* remained practically immune.

Some degree of control was achieved by spraying with 1 to 2 per cent. Bordeaux mixture, the effects of which were more noticeable in 1928 than in 1929, when infection was greatly favoured by hailstorms. In any case spraying, for economic reasons, can only be carried out in exceptional cases and on a limited scale.

JOHNSON (J.). **Breeding Tobacco for resistance to Thielavia root rot.**—*Tobacco*, xc, 4, 1930. [Abs. in *Fortschr. der Landw.*, v, 21, p. 738, 1930.]

A number of American and foreign commercial varieties and strains of tobacco were examined for resistance to root rot (*Thielavia*) [*basicola*: *R.A.M.*, ix, p. 348]. Soil temperatures of 18° to 22° C. were found to favour the disease which was arrested above 26°. In hybridization experiments the F_1 generation of

crosses between resistant and susceptible individuals is intermediate in reaction to root rot, while the F_2 also shows every transitional stage from immune to susceptible. In the F_3 generation, however, these variable individuals were accompanied by a number in which the character for resistance was dominant. The inheritance of this character is believed to be explained on the hypothesis of multiple factors. Descriptive notes are given on the hybrid progeny and on the two chief resistant varieties, Havana No. 142 and Stand-up Burley.

JARRETT (PHYLLIS H.). **The rôle of Thrips tabaci Lindeman in the transmission of virus diseases of Tomato.**—*Ann. of Appl. Biol.*, xvii, 3, pp. 444–461, 1930.

A brief account is given of glasshouse experiments at Rothamsted Experimental Station, the results of which showed that under the conditions tested *Thrips tabaci* does not transmit to the tomato experimental or glasshouse streak of tomatoes [*R.A.M.*, ix, p. 747], or tobacco mosaic. It is therefore concluded that the importance of this insect as a vector of these diseases in commercial glasshouses in England is doubtful.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 8, pp. 73–74, 1930.

Under the new Italian regulations for the importation of seed potatoes (8th July, published in the *Gazetta Ufficiale* on 14th July, 1930), the nomination of regions from which importation is permitted no longer devolves upon the Plant Protection Station in Rome, but the regions in question must conform to certain definite requirements, including freedom from degeneration diseases and wart disease [*Synchytrium endobioticum*: *R.A.M.*, ix, p. 334] and a negligible incidence (below 2 per cent.) of scab [*Actinomyces scabies*].

An Order dated 7th July, 1930, prohibits the importation into Germany of flower bulbs or tubers infected by *Pseudomonas hyacinthi* [ibid., viii, p. 635], *Sclerotinia bulborum* [ibid., v, p. 14], *Sclerotium tuliparum* [ibid., viii, p. 557], *Botrytis tulipae* [loc. cit.], and *Penicillium* sp., in addition to animal parasites. Healthy bulbs must be accompanied by a duly authenticated certificate vouching for their freedom from these diseases.

The Coffee Diseases Rules, 1930.—*Nyasaland Govt. Gaz. Supplement*, 1 p., 31 July, 1930.

The Coffee Diseases Rules, 1930 (made under the Nyasaland Plant Pests and Diseases Ordinance of 1924) [*R.A.M.*, iv, p. 255] enact that coffee or other plants found to be, or suspected of being, infected by any disease or pest shall be subjected to such repressive measures or remedial treatment as may be deemed necessary by the Department of Agriculture. The duties of owners or occupiers of land and the penalties prescribed for the infringement of the Rules are defined.

IMPERIAL MYCOLOGICAL INSTITUTE

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BINKLEY (A. M.). **Transmission studies with the new psyllid-yellows disease of Solanaceous plants (a preliminary report).**—*Proc. Amer. Soc. Hort. Sci., 1929,* pp. 248–254, 1930.

Most of the information in this report has already been noticed from another source [*R.A.M.*, ix, p. 332; x, p. 13], but the following new points are of interest.

During the 1928 growing season the tomato variety work at the Colorado Agricultural Experiment Station was a complete failure owing to the destructive attacks of psyllid yellows, the vector of which was *Paratrioza cockerelli*. Among the varieties affected were Bonny Best, Livingston Globe, Chalk's Early Jewel, and John Baer. The chief symptoms of the disease on tomatoes are the upward curling of the basal portion of the younger leaves, the margins of which turn purplish and finally brown; a noticeable stunting of growth, accompanied by a profusion of secondary sprouts; and the partial or entire absence of flowers and fruits, the latter, when formed, being pale yellow, watery, and insipid. On pepper [*Capsicum annuum*], Jerusalem cherry [*Solanum pseudocapsicum*], and eggplant the disease is characterized by leaf roll, slight dwarfing, and failure to set a normal fruit crop.

Experiments with non-viruliferous nymphs of *P. cockerelli* failed to produce symptoms of the disease, and the author considers that the evidence indicates that the disease may be of a virus nature.

SAMUEL (G.), BALD (J. G.), & PITTMAN (H. A.). **Investigations on 'spotted wilt' of Tomatoes.**—*Australia Council Sci. & Indus. Res. Bull.* 44, 64 pp., 17 pl. [1 col.], 4 figs., 1930.

A full account is given of investigations conducted during 1927–8 at the Waite Agricultural Institute, Adelaide, into spotted wilt of tomatoes [*R.A.M.*, vii, p. 605], the distribution, severity, and symptoms of which are described in considerable detail.

No evidence was obtained that the disease is seed- or soil-borne, but it was, with some difficulty, transmitted by direct inoculation with the expressed juice of diseased plants. Contrary to results previously reported [ibid., vii, p. 410], the onion or rose thrips (*Thrips tabaci*) was not found to carry infection, but transmission

was consistently obtained under controlled conditions with *Frankliniella insularis*, this thrips being associated with all outdoor and glasshouse epidemics of spotted wilt examined in South Australia and New South Wales. The insect was also found in association with wilted tomatoes in Western Australia and at Bendigo, Victoria, though it was not observed near Melbourne, where spotted wilt first appeared and is still occasionally severe. *F. insularis* was also found on many garden flowers in South Australia and New South Wales, and in one case in Western Australia, but was not noted on similar flowers in the vicinity of Melbourne.

Observations showed that an infective individual of *F. insularis* may inoculate a tomato plant with spotted wilt in a feeding period of six hours. When infective individuals were fed for successive days on healthy tomato plants infection was very erratic, but the infective principle was retained in the insects during the twenty-four days that the experiment lasted. The adult hatched from the pupa of a larva fed on a diseased plant may be infective without further feeding on diseased material.

Tobacco and *Nicotiana suaveolens* were successfully inoculated with spotted wilt by feeding infective individuals of *F. insularis* on healthy plants. Symptoms closely resembling those of spotted wilt were also observed on *Solanum nigrum*, *Physalis peruviana*, and potatoes growing among or near diseased tomatoes in the field.

Of 48 [named] commercial varieties of tomato tested none was appreciably resistant, though Early Red Dwarf in three successive seasons consistently showed the lowest infection; the small red currant tomato (*Lycopersicum pimpinellifolium*) was decidedly resistant.

Tests with various [named] insecticides failed to give satisfactory control of the insect vector.

From a comparison of the symptoms and properties of spotted wilt and those of streak in North America [ibid., vii, p. 479; ix, p. 747] it is concluded that the two diseases are distinct.

CALDWELL (J.). **The physiology of virus diseases in plants. I. The movement of mosaic in the Tomato plant.**—*Ann. of Appl. Biol.*, xvii, 3, pp. 429–443, 1 pl., 1930.

After a brief review of the literature relating to the translocation of viruses within the host plant [*R.A.M.*, ix, p. 539], the author gives details of experiments at the Rothamsted Experimental Station to determine the tissues in which this movement takes place in tomato plants inoculated with aucuba mosaic [ibid., ix, p. 417]. This disease was chosen because it is easily transmissible by juice inoculation, is very infectious. and shows particularly well-defined symptoms. In the test plant a middle portion of the stem was killed either by chloroform or by steam, leaving a bridge of dead tissue between the lower and upper portions of the plant, and the inoculations were made either below or above this bridge. In the former case, the disease developed in the lower part of the plant but did not cross the dead region, although histological examination of the latter showed that the xylem vessels were not

materially affected by the treatment, a fact which was confirmed by tests which indicated that water and eosin solution travelled across the dead region. There was no evidence that the vessels were occluded by protein plugs, since particulate substances, e. g., Chinese ink and nigrosin, were carried up the xylem tracts past the dead region. The portions of the tomato plants above the point killed remained turgid and sometimes continued growth for a considerable time, amply sufficient to allow of the full development of aucuba mosaic symptoms.

These results, which indicated that the virus agent was not travelling in the xylem stream, and the observation that inoculation with juices of diseased plants caused systemic infection in all the treated plants with no apparent localization to the side on which the plant had been inoculated, together with other evidence from the literature, lead the author to conclude that the translocation of the aucuba mosaic virus in the tomato plant takes place in the living ground tissue and phloem of the plant.

MAY (C.). **The Dutch Elm disease.**—National Shade Tree Conference, Cleveland, Ohio, 6 pp., 1 pl., 1930.

Some further observations are made on the Dutch elm disease caused by *Graphium ulmi*, five cases of which have recently been detected in Ohio (one at Cincinnati and four at Cleveland) [*R.A.M.*, ix, p. 749]. All the affected trees are American elms [*Ulmus americana*]. The source of infection is so far unknown, all attempts to trace it to a nursery or to imported stock having proved fruitless. The diseased trees have been immediately eradicated in the hope of checking any further spread of the fungus. In one of the diseased trees a discoloured ring was found in the 1928 wood and another in 1930, indicating that the fungus was probably present in the tree at least two years before the death of the latter. The typical coremia of *G. ulmi*, consisting of short, black stalks with a round ball of spores, each measuring 3·2 by 1·7 μ, at the top, have developed in all the cultures from diseased American elms.

PRELL (H.). **Ulmensterben und Ulmenborkenkäfer. Ursachen und Bekämpfung einer epidemischen Baumkrankheit.** [Die-back of Elms and Elm bark beetles. Causes and control of an epidemic tree disease.]—*Die Kranke Pflanze*, vii, 7, pp. 89–93; 8, pp. 103–105; 9, pp. 124–127, 1930.

The writer's surveys in Saxony of elm trees suffering from die-back (*Graphium ulmi*) [a general account of the history and symptoms of which is given] have conclusively shown that the large elm sap beetle (*Scolytus scolytus*) plays an important part in the transmission of the disease [*R.A.M.*, ix, p. 350]. The fungus weakens the tree and renders it suitable for the breeding of the beetle, and the latter acts as a vector of *G. ulmi*. Elms attacked by *S. scolytus* should be felled during June and July, or from October to April, and the bark and insects burnt.

Dufrénoy (J.). **La lutte contre la maladie des Châtaigniers.** [Control of the Chestnut disease.]—*Ann. des Épiphyties*, xvi, 1, pp. 25-49, 5 pl., 15 figs., 1 map, 1930. [Received November, 1930.]

This is an expanded account of the author's investigation of the etiology and control of the ink disease of chestnuts (*Blepharospora* [*Phytophthora*] *cambivora*), a summarized version of which has already been noticed [*R.A.M.*, ix, p. 72]. In addition to the information previously given, it is stated that the Japanese varieties of chestnut (all apparently belonging to the species *Castanea crenata*), which have proved immune from the disease, appear to prosper without the need of any particular care in the Pays Basque, while in the Limousin they require to be set in tilled ground or on the borders of cultivated fields, as they do not seem to do well in compact soil. They also suffer if exposed to too much sunlight and air dryness, for which reason they are better suited for regions with frequent and persistent fogs. Other eastern species that are under trial include *C. coreiensis* and the Chinese species *C. mollissima*, *C. seguinii*, and *C. henryi*.

Regnier (R.). **Note sur le chancre du Peuplier.** [A note on Poplar canker.]—*Bull. Soc. Centr. Forest. Belgique*, xxxvii, 8, pp. 362–365, 1930.

Very heavy losses have recently been sustained in poplar plantations in northern France owing to widespread attacks of canker (attributed by Delacroix to *Micrococcus populi*) [*R.A.M.*, iii, p. 243; v, p. 652].

The disease progresses most rapidly when the tree is very young or when the attack follows wounding, in which case callus protuberances form and rapidly become infected. In primary infections the disease may be said to pass through five stages: the bark swells slightly, and yellow, oblong spots appear, the cortical parenchyma showing near the pericycle a red mark which quickly develops into a lesion; next, the bark swells further and ruptures; in the third stage, a characteristic longitudinal fissure widens, discharging in spring an aqueous liquid which remains on the bark below; this discharge gradually increases in volume, and swellings form around the wound and become infected, the canker itself enlarging and growing deeper: this is the longest and most dangerous stage of the disease and in old trees may last several years. The final stage is reached when the canker girdles and kills the branch or trunk.

The most susceptible poplars are the soft-wooded ones, which grow most rapidly. Even in the most severely stricken areas, however, a variety with a rugose bark, known as 'peuplier de pays' or 'local poplar' has remained unaffected, as have certain light-coloured, smooth-barked varieties, as well as *Populus alba* var. *canescens* and *P. pyramidalis*.

Affected branches on young trees should be removed and burnt. Young cankers on trees under 15 years old should be painted with copper sulphate or milk of lime.

Le chancre du Peuplier. [Poplar canker.]—*Rev. Path. Vég. et Ent. Agric.*. xvii, 7, pp. 254–255, 1930.

Following a discussion at a meeting on 4th July, 1930, of the growing menace to poplar plantations in some regions of France of the so-called bacterial canker [see preceding abstract], the causal organism or organisms of which have not yet been determined [though it was attributed by Delacroix to *Micrococcus populi*], the Société de Pathologie végétale et d'Entomologie agricole de France passed a resolution calling the attention of the French Plant Protection Service to this disease, and expressing the desire that in the affected regions control centres should be established for the purpose of studying the problem and checking the gradual spread of the disease.

GRONEMANN (C. F.). **Witches' brooms of the Chicago area.**—*Trans. Illinois State Acad. Sci.*, xxii (*1929*), pp. 150–151, 6 figs., 1930.

The occurrence of witches' brooms on the following hosts in the Chicago area is recorded: hackberry (*Celtis occidentalis*), willows (*Salix longifolia* and *S. nigra*), hickory (*Carya alba*), box elder (*Acer negundo*), and larch (*Larix decidua*). A similar phenomenon is also reported on pines (*Pinus strobus*) from Indiana. The origin of the brooms is obscure, except in the case of hackberry, where the malformation is attributed to a mite (*Eriophyes* sp.).

SREENIVASAYA (M.). **Contribution to the study of spike-disease of Sandal (Santalum album, Linn.). Part XI. New methods of disease transmission and their significance.**—*Journ. Indian Inst. Sci.*, xiii A, 10, pp. 113–117, 1 pl., 1930.

Further studies on the transmission of spike disease of sandal (*Santalum album*) [*R.A.M.*, ix, pp. 276, 277] have led to the development of two improved methods of communicating infection from spiked to healthy trees, namely, patch-grafting and leaf insertion.

The patches employed in the former method were pieces of bark tissue, including the cortex and the bast, which may readily be skinned from diseased scions and transferred to healthy stocks. Three kinds of patches were used, viz., those with active buds, those with dormant buds, and those without buds. The results [which are tabulated] of the laboratory experiments showed that patches bearing actively growing buds are more virulent and transmit spike in a much shorter time than those with dormant ones (27·5 per cent. transmissions in 57 days in the former case, compared with 11·4 in 98 days in the latter; the corresponding figures for patches without buds were 9·1 per cent. transmissions and 158 days). The operation was further conducted on forest trees at Coorg and North Salem, representing two distinct types of silvicultural conditions, 44 per cent. of transmissions being obtained within 120 days in the former area and 65 per cent. in the latter, where the trees are highly susceptible to the disease [ibid., ix, p. 566].

The leaf insertion method consists in trimming a fresh diseased

leaf to the form of a rectangle, inserting it between the wood and the bark of the stem, covering it with the bark flap, and bandaging it with wax cloth; callus formation normally occurs in 10 to 15 days. Ten out of 14 stocks treated by this method (72 per cent.) developed the disease within periods of 45 to 60 days. This lends support to the view that there is a high concentration of the infective principle in the leaf.

Transmission was not effected by patch-grafting of root bark on root, leaf mutilation, wood grafting, or injection of tissue fluids.

In the course of these experiments indications were obtained that there are several varieties of sandal differing in their disease-resisting properties. One very resistant variety appears to be characterized by a definitely ovate leaf, a stem rich in lenticels, and a root with a high haustorizing capacity.

NORRIS (R. V.). **Spike disease of Sandalwood.**—*Nature*, cxxvi, 3174, p. 311, 1930.

A brief survey is given of the method of organization of the spike disease of sandal [*Santalum album*] investigation now in progress in the Biochemical Department of the Indian Institute of Science, Bangalore, Mysore [see preceding abstract]. It has been shown that the nature of the host parasitized by the sandal tree probably exerts a considerable influence on the susceptibility of the latter to infection.

SREENIVASAYA (M.). **Occurrence of mannitol in spike disease of Santalum album L.**—*Nature*, cxxvi, 3177, p. 438, 1930.

While investigating the water-soluble constituents of the spiked leaf of sandal (*Santalum album*) [see preceding abstracts], the writer found that crystals of mannitol separated on slowly evaporating the extract after clarification with basic lead acetate. Two or three per cent. of the alcohol, calculated on the weight of the green material, has been found in all the 15 samples examined, while in no case was it detected in healthy samples. Hence it would appear that mannitol is one of the metabolic products of the virus.

LIESE (J.). **Beobachtungen über Stamm- und Stockfäulen unserer Waldbäume.** [Observations on trunk and stump rots of our forest trees.]—*Zeitschr. für Forst- u. Jagdwesen*, lxii, 7–8, pp. 579–591, 5 figs., 1930.

Notes are given on the rots of pine trunks caused in Germany by *Polyporus schweinitzii* [*R.A.M.*, ix, p. 149], *Sparassis crispa* (producing a yellowish-brown discoloration of the wood accompanied by a strong odour of turpentine), and *Merulius silvester* [ibid., viii, p. 280]; and on oak canker due to *Stereum rugosum* [ibid., viii, p. 211], a case of which was recently observed in a stand of 30- to 40-year-old trees near Berlin.

TAI (F. L.). **Studies in Gymnosporangia on Juniperus chinensis. I. Gymnosporangium yamadae Miyabe.**—*Lingnan Sci. Journ.*, Canton, China, ix, 1–2, pp. 13–28, 3 pl., 3 figs., 1930.

Several species of *Gymnosporangium* occur in a parasitic form

on *Juniperus chinensis* in the vicinity of Nanking, China. The auburn galls of *G. yamadae* [*R.A.M.*, v, p. 369] become visible in the autumn; by the latter part of February teleuto tendrils protrude through the peridium. In the teleuto stage the haustoria are generally bell-shaped and binucleate, whereas in the aecidial phase (which causes a serious disease on the apple) they are finger-shaped and uninucleate. The aecidiospores appear to mature during the latter part of September. Positive results were given by inoculation experiments with *G. yamadae* on apple and *Malus* [*Pyrus*] *baccata* (another natural host, as are also *M.* [*P.*] *spectabilis* and *M.* [*P.*] *toringo*) but not on quince or *Prunus serotina*.

WHITE (R. P.). **Juniper blight.**—*Fiftieth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 270–272, 1929. [Received October, 1930.]

Heavy and widespread damage to juniper (*Juniperus virginiana* and other species) seedlings in New Jersey is stated to be caused by *Phomopsis juniperovora* [*R.A.M.*, ix, p. 509], losses amounting to 25 per cent. or more being common. Most of the horticultural varieties of *J. virginiana* are susceptible (especially *tripartita*), but *keteeleri* appears to be highly resistant; *J. sabina* is also susceptible, but *J. chinensis, J. excelsa, J. communis, J. scopulorum*, and *J. squamata* are generally more resistant. On *Chamaecyparis* the fungus is often found causing severe damage following winter injury. A closely related fungus, *P. occulta*, attacks various species of spruce (*Picea pungens* [vars.] *glauca* and *glauca kosteri*, and *P. engelmanni*) under unsuitable conditions of cultivation. Good control of the juniper disease was given by the application of 0·25 per cent. uspulun and other standard preparations, and by the removal of infected tips.

RUMBOLD (CAROLINE T.). **The relationship between the blue-staining fungi Ceratostomella and Graphium.**—*Mycologia*, xxii, 4, pp. 175–179, 1930.

The author's cultures from blue-stained wood have yielded *Ceratostomella* and *Graphium* stages singly or both together. In only one case was it established that the two stages were belonging to the same fungus, which is considered to be a strain of *C. pilifera*, one of the most common blue-staining fungi in timber yards [*R.A.M.*, ix, p. 354]. This species comprises many strains varying in minor details, such as the size and shape of their perithecia and their habits of growth in and on the sapwood of hardwoods and softwoods, but such differences are not considered sufficient to justify the establishment of distinct species. Its conidial stage resembled *G. penicillioides*.

HIRAYAMA (S.). **Studies on Polystictus sanguineus.**—*Bull. Sci. Friends' Assoc. Higher School Agric. & Forest.*, Mie, i, pp. 21–42, 1 pl., 2 figs., 1929. (Japanese, with English summary.) [Abs. in *Japanese Journ. of Botany*, v, 2, p. (32), 1930.]

Polystictus sanguineus [*R.A.M.*, ii, p. 589], with which *P. cinnabarinus* [ibid., ii, p. 484] is considered to be synonymous, is stated to grow readily on artificial media, solid ones being specially well

adapted to the development of the reproductive organs. The optimum temperature for growth was found to be 40° C. The red pigment contained in the mycelial cells reacts similarly to 'xanthotrametin' from *Trametes cinnabarina* [ibid., ix, p. 216] with various reagents, and its production is apparently stimulated by light. Though *P. sanguineus* was shown by inoculation experiments to be omnivorous, it exhibits a marked preference for dicotyledonous woods as opposed to that of conifers.

KENDRICK (J. B.). **Kale yellows in California, caused by Fusarium conglutinans Wollenw.**—*Hilgardia*, v, 1, pp. 1–15, 4 figs., 1930.

Extensive plantings of Jersey or Thousand Headed kale [*Brassica oleracea* var. *acephala*] in the Petaluma district, Sonoma County, California, are annually severely affected by yellows (*Fusarium conglutinans*) [cf. *R.A.M.*, ix, p. 510], though the disease has not been observed elsewhere in California either on kale or other species of *Brassica*.

The disease usually attacks seedlings, on which it causes characteristic yellowing and dropping of the leaves from the ground upwards. It is often confined to one side of the plant. If high temperatures prevail many of the affected plants rapidly die, but if the prevailing temperatures are comparatively low diseased plants may continue to make a weak growth, though remaining stunted and yellow.

The author's inoculation experiments [which are described and tabulated] proved that the Wisconsin strain of *F. conglutinans* from cabbage and the Californian kale strains showed no significant differences in pathogenicity on kale or the other *Brassica* varieties tested.

F. conglutinans is soil-borne, and the disease is largely spread to new localities by infected transplants. Once the soil is infected the most promising method of control consists in the development of resistant strains of the host plant.

WHITE (H. E.). **Bacterial spot of Radish and Turnip.**—*Phytopath.*, xx, 8, pp. 653–662, 3 figs., 1930.

Turnips at Matthews, Indiana, and radishes at Purdue University were found, in June and July, 1928, to be affected by a bacterial disease characterized by black or brown circular lesions on the leaves and elongated, deeply sunken, black lesions on the petioles and stems of young plants [*R.A.M.*, viii, p. 348]. The causal organism [the morphological and cultural characters of which are fully described with a technical diagnosis in English], is a yellow, monoflagellate bacterium measuring 2 to 3·1 by 0·65 to 1·2 μ (average 2·49 by 0·96 μ) and making good growth at 21° to 32° C., with a thermal death point at 50° to 52°; gelatine is liquefied. The group number of the organism, which is named *Bacterium vesicatorium raphani* n. var. [cf. ibid., ix, p. 289], is 5322–31135–1333 (chart of the Society of American Bateriologists).

Cabbage, cauliflower, Brussels sprouts, kale [*Brassica oleracea* var. *acephala*], mustard, tomato, pepper [*Capsicum annuum*], and tobacco are susceptible to infection by the organism. On cabbage, kale, cauliflower, and Brussels sprouts leaves the bacterium forms circular, chalk-white lesions.

Comparative cultural and inoculation tests indicated that the radish organism closely resembles *Bact. campestre* [*Pseudomonas campestris*] and *Bact. campestre* var. *armoraciae* [ibid., viii, p. 544] as well as *Bact. vesicatorium*, from all of which it differs slightly, however, both in host range and type of symptoms.

Bact. vesicatorium raphani was found to be carried on commercial radish seed, with consequent seedling infection. Superficial sterilization of the seed with mercuric chloride (1 in 1,000) afforded only partial control.

TOMPKINS (C. M.) & NUCKOLS (S. B.). **The relation of type of topping to storage losses in Sugar Beets.**—*Phytopath.*, xx, 8, pp. 621–635, 3 figs., 1930.

Further observations have been made on the 'crown rot' developing in sugar beets as a result of infection by *Phoma betae* and *Fusarium* spp. through wounds inflicted by topping at the line of the lowest leaf scar [*R.A.M.*, viii, p. 284].

From 800 tissue plantings made from 400 sugar beets affected by crown rot at Logan, Utah, 381 cultures of *P. betae* and 339 isolations of two species of *Fusarium*, viz., *F. culmorum* and a species resembling *F. oxysporum*, were obtained. Isolations of the same fungi were further made on a limited scale at Lewiston, Utah. Inoculation experiments on healthy beet roots resulted in up to 100 per cent. infection by *P. betae*, the corresponding maxima for *F. culmorum* and *F.* sp. being 81·4 and 57·1 per cent., respectively.

Approximately 51 per cent. of the total number of beets examined (over 10,000) were topped by the above-mentioned commercial method, and of these 63 per cent. were diseased. A marked decline in the incidence of infection followed topping one-half and one-quarter inch above the line of the lowest leaf scar, while a very marked increase occurred when the crowns were severed one-quarter or one-half inch below this line. Where the beets were topped at the base of the lowest leaf scar or lower, the amount of decayed tissue varied between 14 and 25 per cent., while above this region it ranged from 4 to 8 per cent. It is believed that a considerable reduction in the heavy losses due to crown rot in stored beets could be effected by a modification of the commercial methods of topping.

BÖNING (K.). **Ueber eine Blattdeformationskrankheit an Rübe und Spinat.** [On a leaf deformation disease of Beet and Spinach.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 7, pp. 315–323, 7 figs., 1930.

Since 1927 the writer has observed a leaf disease of beets, spinach, *Rumex obtusifolius*, and *R. crispus* in south Germany

The leaf surface is more or less reduced and often excessively thickened, while the tissues are very brittle. Sometimes the midrib is practically all that remains of the leaf. In other cases the blades show a downward rolling accompanied by the irregular malformation of certain parts, a condition strongly reminiscent of that produced by aphids. In the early stages of the disease the affected foliage sometimes showed an abnormally dark coloration, but there were no signs of mosaic spotting.

When the disease affects young beets a marked arrest of growth often ensues, while those attacked in a more advanced stage of development produce an excessive amount of foliage, the wreath of rosettes springing from the tuft being composed of small, deformed leaves. The over-production of leaves leads to an elevation of the vegetation cone and consequent formation of conical beets. There were no direct symptoms of disease on the bodies of affected beets (apart from cavity formation) or on the roots.

Beets attacked during the first year of growth developed diseased shoots again in the following spring; the pathological symptoms, however, were much slighter than in the preceding season and they scarcely recurred at all in plants affected at an advanced stage of growth. Dwarfed individuals attacked during the juvenile phase first formed a leaf rosette of healthier appearance than that produced in the previous season and did not develop their shoots until later. The most weakly plants died off during the winter.

The results of transmission experiments [which are described] indicated that *Aphis rumicis* and *Myzus persicae* are vectors of the disease. The incubation period of 14 days or more is followed by an upward rolling of the leaf edges which persists only until the maturity of the affected leaves, when the final symptoms described above develop on the younger foliage of the rosettes or shoots. The symptoms on spinach and *Rumex* are similar to those on beets, while an analogous condition has also been observed on *Phlox decussata* and (by Dr. K. Flachs) on radishes.

All the available data point to the inclusion of the new disease in the virus group, but it is evidently distinct from the various other manifestations of this type affecting the Chenopodiaceae, e.g., beet mosaic and leaf curl and spinach blight and mosaic [cf. *R.A.M.*, vi, pp. 330, 591; vii, p. 136].

BROWN (R. E.). **Note regarding a possible influence of soil reaction on development of powdery mildew on Cowpeas.**—*Phytopath.*, xx, 8, pp. 683–685, 2 figs., 1930.

In a test conducted in 1929 at Arlington, Virginia, to determine the comparative efficacy of various phosphatic fertilizers in the control of powdery mildew of cowpeas [*Erysiphe polygoni*] on a soil with a reaction of P_H 4·8, which was altered in some of the pots, by the use of different types of phosphatic fertilizers, to 6·4 and 7·5, respectively, it was observed that the disease was most prevalent at the last-named hydrogen-ion concentration and entirely absent at the first. The preference of the fungus for alkaline soil conditions is thus clearly demonstrated.

HEADLEE (T. J.), MARTIN (W. H.), & FARLEY (A. J.). **1930 spray schedule for Grapes.**—*New Jersey Agric. Exper. Stat. Circ.* 224, 2 pp., 1930.

The following treatments are recommended for the control of black rot [*Guignardia bidwellii*] and other fungous diseases and insect pests of grapes under average conditions in New Jersey. (1) When the new shoots are 8 to 12 inches long; (2) just after blossoms fall; (3) ten days after (2); and (4) ten days to a fortnight after (3) and at similar intervals until 10th August: Bordeaux mixture 4–6–50 for each application, plus 2 to 3 lb. lead arsenate per 50 galls. of mixture at the second.

MANUEL (H. L.). **Copper sprays versus copper-containing dusting powders. Experiments in the control of Grape Vine diseases.**—*Agric. Gaz. New South Wales*, xli, 8, pp. 619–624, 5 figs., 1930.

The author states that the three chief diseases of the vine in New South Wales are *Oidium* [*Uncinula necator*], black spot or anthracnose [*Gloeosporium ampelophagum*], and downy mildew [*Plasmopara viticola*], of which the last-named is much the most frequent and hard to control. Practical field experience, supported by a series of experiments at the Viticultural Nursery at Narara, tends to show that Bordeaux and Burgundy mixtures are the best fungicides for keeping this disease in check, since the copper-containing dusts tried were less effective and some caused definite injury to the foliage. The sprays also gave a certain amount of control of anthracnose. Chemical analysis of vine leaves sprayed and dusted showed that the latter contained 115 times less copper than the leaves sprayed with 10–5–50 Bordeaux and 125 times less than those sprayed with 6–4–50 Bordeaux. In the treatment of anthracnose the spring and summer spray treatments should be preceded by a winter swabbing of the vine stocks with sulphate of iron or sulphuric acid solution.

Zpráva o škodlivých činitelích kulturních rostlin v Republice Československé v roce 1929. [Report on the agencies injurious to cultivated plants in the Republic of Czecho-Slovakia in 1929.]—*Ochrana Rostlin*, x, 1–2, pp. 1–55, 10 figs., 1930.

In the section of this report dealing with cereal diseases (by F. Šeda), it is stated that the exceptionally hard and prolonged winter predisposed the crops in early spring to the attacks of snow mould (*Fusarium nivale*) [*Calonectria graminicola*] to such an extent that a number of rye, wheat, and barley fields had to be resown. The weakened state of the plants also favoured in many districts the development of mildew (*Erysiphe graminis*) on rye and barley, and of *Cladosporium herbarum* on wheat. In a field of wheat in Carpathian Ruthenia a severe outbreak occurred of *Dilophia graminis* [*R.A.M.*, viii, p. 301] which was found in the perithecial stage attacking and destroying the wheat ears. This fungus is stated to have been recorded a few years previously from Czecho-Slovakia, but so far its incidence had only been sporadic and very slight.

According to Říha, owing to the very dry summer potatoes were exceptionally free from late blight (*Phytophthora infestans*) and yellow leaf spot (*Cercospora concors*) [ibid., viii, p. 332]. New infection foci of the potato wart disease organism (*Synchytrium endobioticum*) [ibid., viii, p. 806] were found in two localities of Bohemia, one of Moravia, and two of Silesia. Powdery scab (*Spongospora subterranea*) [ibid., ix, p. 264] is apparently gaining ground in Czecho-Slovakia from year to year. Mosaic was the most common potato virus disease, especially in yellow-fleshed varieties (e.g., Industry, Dukat, and Professor Gisevius), in which it attained an incidence of 50 per cent. Next in importance came leaf roll, but mottle and leaf curl were comparatively scarce and mild, although the last-named disease appears to be gradually spreading in Czecho-Slovakia.

Novák reports that early season cucumbers under glass were severely attacked by *Cladosporium cucumerinum* [ibid., viii, p. 626]; in some localities later field crops also suffered from *Corynespora* [*Cercospora*] *melonis* [ibid., vii, p. 556]. The necessity is stressed of establishing strict control over onion seed imported from abroad, since crops raised from such seed proved to be heavily infected with *Fusarium cepae* [ibid., viii, p. 351], a disease which now constitutes a serious menace to onion cultivation in the south of France and in Germany. In one locality an epidemic outbreak occurred of *Sclerotium cepivorum* [ibid., ix, p. 356] on garlic.

Říha states that the spring of 1929 was marked by heavy outbreaks of downy mildew of hops (*Pseudoperonospora humuli*) practically over the whole of Czecho-Slovakia, but the disease did very little damage since it was arrested early in the season by dry and warm weather. He believes that the comparatively small losses caused by *P. humuli* in the period from 1927 to 1929 are in a great measure due to the very high resistance of the Semšov red variety which is mainly grown in Czecho-Slovakia, the local climate being also unfavourable to the development of the disease. *Botrytis cinerea* again reappeared on hop cuttings in the fields in which the infection was first recorded in 1926 [ibid., viii, p. 130]; the pathogenicity of the fungus to such cuttings was proved in artificial infection experiments which, under favourable conditions of humidity, gave over 80 per cent. successful infections. The condition locally known as 'kadeřavost'' [equivalent to the German term 'Kräuselkrankheit' and meaning 'curliness': ibid., viii, p. 603] again appeared in 1929, but did not attain great severity; it was shown to be transmissible by cuttings, grafts, insects, and human agency, and also through the soil (presumably by soil-inhabiting insects), as about 20 per cent. of healthy cuttings planted in infected soil developed the disease. A constant symptom of the disease is the protrusion of the anastomoses of the veins on the under side of the leaves.

In the section dealing with the vine, Vielwerth states that the disease considered by him to be a mosaic [ibid., vi, p. 213] was again observed in Mělnik, where it is attracting increasing attention owing to its destructiveness and infectivity. What appears to be a second virus disease of the vine was observed in Mutěnici.

SAVULESCU (T.). **L'état phytosanitaire en Roumanie au cours de l'année 1928–1929.** [Phytosanitary conditions in Rumania during the year 1928–1929.]—*Ann. Inst. Recherches Agron. de Roumanie*, i, pp. 214–266, 10 figs., 2 maps, 1930. [Rumanian, with French translation.]

Among other items of phytopathological interest in this report the following may be mentioned. *Septoria tritici* [*R.A.M.*, ii, p. 212; ix, p. 297] was observed on wheat in the Danube valley, the Dobrudja, and south Bessarabia during November, 1929, the distribution and intensity of the disease being shown by means of a map. The heaviest damage occurred on the pure lines American 15 and 26, while a high degree of resistance was shown by the selections Miercurea Ciucului, Urtoba, and Sămânţa 117.

Nigrospora oryzae [ibid., vi, p. 758] caused a greyish-black rot of the rachids of maize (*Zea mays* var. *dentiformis*) in the environs of Bucharest.

Tobacco seedlings are liable to infection by *Alternaria tenuis* [ibid., ix, p. 2], sometimes in conjunction with *Pythium de Baryanum*. *Phytophthora nicotianae* [ibid., ix, p. 211] occurred in a mild form on the leaves and stalks of tobacco from Dambovitza and Vlaşca. The leaf spots of tobacco caused by *Ascochyta nicotianae* [ibid., ix, p. 227], *Phyllosticta tabaci* [ibid., ix, p. 1], and *Cercospora nicotianae* [ibid., ix, p. 140] were prevalent in all districts. The distribution and intensity of the 'Wisconsin leaf spot' of tobacco (*Bacterium melleum*) [ibid., x, p. 62] are shown by means of a map.

Sporidesmium solani varians Vanha [*Alternaria solani*: ibid., iii, p. 569] was observed near Bucharest on early potato varieties which were not, however, severely injured by the fungus. Stored potatoes were attacked by *Bact. sepedonicum* [ibid., x, p. 51].

White rot [also known as coître or hail disease] of the vine, caused by *Charrinia diplodiella* (the pycnidial stage of which is *Coniothyrium diplodiella*) [ibid., iv, p. 460; vi, p. 207; x, p. 10] was much in evidence in Bessarabia, Moldavia, and Transylvania during the hot, damp summer of 1929. The fungus chiefly attacks the fruit and has also been observed on the twigs but not on the leaves. The losses caused by this organism during the period under review are estimated at 10 to 15 per cent. of the possible harvest. *Sordaria uvicola* [ibid., vi, p. 207] was found on grapes in Bessarabia. *Septoria ampelina* [ibid., viii, pp. 16, 223] produces small brown spots with blackish edges on the leaves of American vines in nearly all the viticultural regions of Rumania. 'Apoplexy' or 'esca' (*Stereum necator*) [ibid., ix, p. 13] was very prevalent during 1929 in old vineyards, especially in Bessarabia, the Aligoté, Muscat, Madelein, and Plăvaia varieties being most susceptible. The fungus was found chiefly in the trunks and branches, rarely descending as far as the roots. Infection by *S. necator* was accompanied by court-noué [ibid., ix, p. 578] on argillo-calcareous soils.

Chives [*Allium schoenoprasum*] in the vicinity of Bucharest were occasionally attacked by *Urocystis cepulae* [ibid., ix, p. 509].

The dying-off of Lombardy poplars [*Populus pyramidalis*] due to *Cenangium populneum* [ibid., v, p. 652] continues to cause

heavy damage in the Vaslui department, where it was first observed in 1925.

Gummosis of peach trees [ibid., vi, p. 298] is most prevalent on the Madeleine blanche, Belle Beausse, and Brugnon Stanwich varieties in the impermeable soils of the steppes (up to an altitude of 120 m.). Peaches grafted on myrobalans [*Prunus divaricata*] are more susceptible to gummosis than those for which almonds are used as stocks. In addition to cultural measures, the painting of wounds and cuts with iron sulphate and a coating of lime, and the application of 1 per cent. Bordeaux mixture in the spring are recommended for the control of gummosis.

Serious damage is caused in the Danube Valley, Moldavia, and the Dobrudja by the dying-off of apricot trees [ibid., ix, p. 465], with which *Schizophyllum commune* [ibid., viii, pp. 3, 193; ix, p. 267] was associated in an actively parasitic form during the excessively cold winter of 1928 9.

Mulberries in the Dambovitza department were attacked by *Bact. mori* [ibid., viii, p. 142; ix, p. 507], which produced longitudinal black fissures on the young branches and also affected the leaves, causing considerable injury. This is the first record of the parasite in Rumania. The leaf spot of mulberries due to *Cercospora pulvinata* [ibid., ix, p. 135] was reported from R. Vâlcea.

Baudyš (E.). **Fytopathologické poznámky V.** [Phytopathological notes V.]—*Ochrana Rostlin*, ix, 5, pp. 108–128, 10 figs., 1929. [German summary. Received December, 1930.]

The author states that, in consequence of an extremely hard winter followed by an exceptionally dry spring, the growth of most of the agricultural crops and other plants was considerably retarded in 1929 in Moravia and their resistance to disease was much lowered. These conditions were responsible for severe outbreaks of peculiar forms of glassiness and bitter pit [a description of which is given] in apples; the latter developed while the fruit was still on the trees, in contradistinction to the usual form which only appears in storage. Young trees appeared to be more susceptible to the troubles than older ones. The climatic extremes also adversely affected vines, many of which, especially older plants grafted on American stocks, perished from (non-parasitic) apoplexy, and others from 'bacterial tuberculosis' caused by *Pseudomonas* [*Bacterium*] *tumefaciens*. They also intensified the symptoms of mosaic usually observed in various plants, especially in raspberries. Observations during 1929 on this host showed that the sharpness of the distinctions drawn by the author between the four virus diseases of the raspberry in a previous paper [*R.A.M.*, vii, p. 333] greatly varied with the altitude of the station of growth of the host, and that all combinations of the symptoms of each type frequently appeared on the same plant; this is considered to conflict with his former view of the existence of several types of raspberry mosaic. Severe mosaic was also observed on sweet peas (*Lathyrus odoratus*) [ibid., viii, p. 55], and on sugar and fodder beets; the interesting fact was noticed that beets affected with mosaic appeared to be entirely immune from attacks of *Cercospora* [*beticola*] and rust [*Uromyces betae*], both of which

were otherwise very severe locally on these crops. Of recent years it has been observed that certain flowering plants, including *Pelargonium*, *Dahlia*, *Begonia*, and *Petunia*, are being increasingly attacked and killed by *Bact. tumefaciens*. In southern Bohemia *Bacillus carotovorus* was found in 1928 causing a heart rot of celery.

Walnut seedlings in nurseries were killed in large numbers by a blight associated with as yet unidentified species of bacteria and *Fusarium*, and infection experiments are in hand to establish which of these organisms is responsible for the disease.

PARK (M.). **Report of the Mycological Division.**—*Ceylon Dept. of Agric., Tech. Repts. for the year 1929*, pp. 1–6, 1930. [Received November, 1930.]

New records of fungal diseases made in Ceylon during 1929 [which are listed] include *Parodiella grammodes* on *Crotalaria usaramoensis*, *Rhizoctonia* [*Corticium*] *solani* on nursery seedlings of *Hevea* rubber, *Sclerotium rolfsii* on *Eleusine coracana* [*R.A.M.*, viii, p. 424], and leaf curl of tobacco.

The severity of outbreaks of mildew on *Hevea* rubber (*Oidium heveae*) [*R.A.M.*, ix, pp. 88, 804] varied in different districts; in Kandy district the disease did not become very prevalent after wintering until most of the leaves had matured, with the result that the outbreak there was less severe than previously. Elsewhere, however, heavy loss of foliage continued throughout the year. The disease appears to be assuming considerable importance in the drier areas of the island.

Susceptibility to severe bark rot injury due to *Phytophthora* sp. was transmitted from a susceptible mother tree of *Hevea* rubber to its budded clone; when selecting mother trees for propagation trees showing any marked susceptibility to bark rot should be discarded.

A case was reported where, to protect the young rubber bud, *Vigna* [*oligosperma*] was wrapped round the stump, with the result that *C. solani* spread from the *Vigna* to the shoot. The use of *Vigna* for this purpose is, therefore, not recommended.

At mid- and low-country elevations wood rot (branch canker) [*Ustulina zonata*, *Aglaospora aculeata*, and other fungi: ibid., viii, p. 470] may interfere with the growth and development of tea bushes. It is becoming evident that the incidence of the disease is associated with the method and time of pruning. Careful pruning, the institution of a 'second round' to remove snags, and pruning 'when the sap is running' will tend to reduce the prevalence of the rot.

Grey blight [*Pestalozzia palmarum*: ibid., viii, p. 170] appeared to be the most prevalent disease of coco-nut, but was serious only when the cultural conditions were unsatisfactory.

Mosaic diseases of brinjal [*Solanum melongena*] and bandakkai [*Hibiscus esculentus*] continue to cause much damage in gardens where control is not promptly undertaken. Other diseases recorded include bud rot and fruit disease of areca palms (*Phytophthora arecae*) [ibid., viii, p. 704], rust of fig leaves (*Physopella* (*Uredo*) *fici*) [*Cerotelium fici*: loc. cit.], *Corticium salmonicolor* on jak

[*Artocarpus integrifolia*], *Vermicularia capsici* and *S. rolfsii* on chillies [*Capsicum annuum*], red rust (*Cephaleuros parasiticus*) on the stems and leaves of *Tephrosia candida*, *Fusarium* die-back of dadap [*Erythrina lithosperma*; ibid., vii, p. 68; viii, p. 688], and mildew (*Oidium* sp.) on the leaves of *Centrosema pubescens*.

The commonest citrus diseases were canker (*Pseudomonas citri*) and the mildew *Oidium tingitaninum* [ibid., viii, p. 89], both of which were satisfactorily controlled by weekly applications of a 2 per cent. solution of sulfinette. Other citrus diseases included gummosis of twigs, scab (*Sporotrichum citri*), and blast (*Bacterium* [*Pseudomonas*] *citriputeale*), while cold storage spot or pox was observed on imported grapefruit.

The prosecution of stringent control measures has reduced the incidence of bunchy top of plantains [ibid., viii, p. 184, and below, p. 117].

Sclerotia of fungi associated with diseases of rice were kept under different conditions for long periods and it was ascertained that all five strains tested (two of *Corticium solani* and three of *Sclerotium oryzae*) [ibid., ix, p. 484] remained viable after being submerged in water for 244 days, and that the sclerotia of *S. oryzae* remained viable in a dry condition for over 500 days.

DEIGHTON (R. C.). **Annual Report of the Mycological Section for the year 1929.**—*Ann. Rept. Agric. Dept. Sierra Leone for the year 1929*, pp. 20–23, 1930.

A collapse of the pseudostem of bananas, attributable to drought, is very common in Sierra Leone during the dry season. The pseudostem collapses at about the middle of its length, especially when fruiting, and the upper part hangs down. The older leaves may collapse first at the base, but they do not always turn yellow, though a greyish blotching may be present, especially at the edges. The leaf bases on the outside of the pseudostem are always very dry and papery. If the upper part of the plant is supported some inferior fruit may ripen, but it often remains undeveloped and finally shrivels.

White thread blight [? *Marasmius scandens*: *R.A.M.*, vii, pp. 93, 565] was present on cacao and kola [*Cola acuminata* and *C. vera*] in nearly every village in two districts of the Southern Province and also round Makump, Northern Province, while horse-hair blight [*Marasmius* sp.], not previously reported in Sierra Leone, was found in several localities on the same hosts. The cacao becomes infected through being planted in the shade of diseased kola trees, and control measures such as drastic pruning or felling are often difficult to apply, as religious or sentimental significance is attached to the kola trees which, further, sometimes do not belong to the same owner as the cacao. *M. scandens* was noted on *Funtumia africana* and horse-hair blight on *Leptodermis fasciculata* in the bush. A few cases of root disease of kola were seen, the fructifications of a *Fomes* developing from the trunk at ground level; other root infections of kola and young cacao were attributed to *F. lignosus*.

Several rather old cacao trees in a low-lying plantation were badly affected by collar crack; the leaves had fallen from the

extremities of the branches, and there was marked die-back. Longitudinal cracks on the trunk extended up to five feet from the ground, and all the symptoms resembled those reported from the Gold Coast [where the disease is due to *Armillaria mellea*: ibid., vi, p. 659; but see also ibid., viii, p. 267], except that the frilly outgrowths of the xylostroma of the fungus from the cracks were absent.

Between August and October the leaves of young grapefruit at Njala were severely affected by scab [*Sporotrichum citri*], though the condition was not serious at the beginning of the rainy season in May.

A few native-grown sweet orange trees in the villages were affected by gummosis; the rarity of this disease is attributed to the fact that the roots of the trees are generally exposed owing to the heavy rains washing away the soil at the base of the trunk.

VENKATA RAO (M. K.). **Annual Report of work done in the Mycological Section during the year 1928–29.**—*Ann. Rept. Agric. Dept. Mysore for the year 1928–29*, Part I, pp. 18–21, 1930.

The following are some of the items of interest in this report of mycological work in Mysore during 1928–9[cf. *R.A.M.*, viii, p. 764]. At the field laboratory of Talaguppa pure cultures of a fungus similar to the causal organism of areca koleroga [*Phytophthora arecae*] were isolated from sandal [*Santalum album*], jak [*Artocarpus integrifolia*] leaves, *Loranthus*, *Jatropha curcas*, wild fig [*Ficus nitida*], *Colocasia* [*antiquorum*], and *Bryophyllum* [*calycinum*]. Cross-inoculation tests showed that infection was transmissible from sandal, *J. curcas*, and *B. calycinum* to areca nut [ibid., vi, p. 289].

The inoculation of healthy tomato plants, by means of hypodermic injections and fine pin punctures on leaves, petioles, and growing points, with the leaf extract of plants affected by leaf roll, resulted in the development of marked curling of the foliage in about 50 days.

A species of *Heterosporium*, characterized by brown, 2- to 16-celled spores, was isolated from whitish spots on the grains of *Eleusine coracana*, the flour from which caused poisoning in human beings.

HASKELL (R. J.) & WOOD (JESSIE I.). **Diseases of plants in the United States in 1929.**—*Plant Disease Reporter, Supplement* 75, 78 pp., 2 pl., 5 maps, 1930. [Mimeographed.]

The present summary of plant diseases in the United States differs from previous surveys, which contained the major part of the data collected during a given year, in the inclusion of only the more recent and important facts. It has thus been possible to include all the crops together in one report, instead of devoting a special supplement to each group as in former years [cf. *R.A.M.*, viii, pp. 633, 726; ix, pp. 93, 628]. Wheat scab (*Gibberella saubinetii*) was exceptionally severe in Kansas and Arkansas, the average loss for the former State being estimated at 12 per cent. (3,000,000 bushels). In Missouri the disease did not develop until fairly late in the season owing to the relatively low temperatures of the

spring months. Scab also occurred in Nebraska, where it had not been reported since 1923. Both winter wheat and winter barley were damaged by *G. saubinetii* in Virginia and West Virginia, while severe injury was also reported from Ohio, Indiana [see below, p 91], northern Illinois, and south-western Wisconsin, where barley was grown on maize land. The distribution of barley scab is shown by means of two maps. Speckled leaf blotch of wheat (*Septoria tritici*) [see above, p. 77 and next abstract] assumed epidemic proportions in Texas, Oklahoma, Kansas, and parts of Missouri and Iowa.

Brown spot of maize (*Physoderma zeae-maydis*) [ibid., vii, pp. 303, 711; ix, p. 19] was reported from a number of southern States, being most prevalent in North Carolina and Louisiana.

Scab of cowpeas (*Cladosporium vignae*) [ibid., vii, pp. 76, 307] was reported for the first time from Georgia, where considerable losses occurred in the centre of the State.

Observations on ascospore discharge in the apple scab fungus (*Venturia inaequalis*) [ibid., x, pp. 11, 36] were reported by nine States. This phase in the life-history of the fungus is continually assuming greater importance in connexion with supplementary spraying recommendations in sections where the disease is prevalent. *Pseudomonas papulans,* the cause of a blister spot of apple fruits, had not been detected with certainty in the United States between 1917 and 1929, when Gardner reported abundant infection on green Rome apples at Lafayette, Indiana [ibid., vii, p. 328]. Severe injury was inflicted on apple trees in North Carolina and North Dakota by *Schizophyllum commune* [ibid., v, p. 373], which killed large limbs and even the entire tree in some cases. In North Carolina infection appears to have followed injury by low temperatures, cultivating implements, and blight (*Bacillus amylovorus*).

A virus disease of strawberries, tentatively termed mosaic, has been reported as causing considerable local damage in the northern and eastern United States and Canada [ibid., viii, p. 354]. The disturbance is stated to be definitely distinct from the xanthosis or yellows of the Pacific Coast [ibid., ix, p. 153] and from the dwarf or 'crimps' of the southern States [ibid., vii, p. 651].

Muskmelons in Georgia were severely infected by a bacterial leaf speck which caused extensive premature defoliation. Typical speck lesions were obtained by the inoculation of cantaloupes and watermelons with water suspensions from diseased cantaloupe leaves.

Heavy damage was caused in Michigan by celery yellows [ibid., ix, p. 289], to which the strains developed by the State College, M.S.C. Golden Self Blanching and Newark Market, proved resistant. The disease was further reported from a few places in Minnesota, and occurred in a destructive form near Cañon City, Colorado, the latter being a new record. Severin has shown (*Hilgardia*, iii, p. 543, 1929) that both celery and lettuce yellows [*R.A.M.*, ix, p. 580] are identical with aster yellows and transmissible by *Cicadula sexnotata*. Folsom found what is apparently the same disease in Maine, where the leafhopper was captured by systematic sweepings. In Wisconsin, yellows was observed on celery growing adjacent to an experimental aster yellows plot.

Lettuce yellows, formerly known as Rio Grande disease, rabbit's ear, or white heart, was reported in 1929 from a number of States, being found in Wisconsin, especially on plants in contact with affected asters. Salsify [*Tragopogon porrifolius*] was also reported to be suffering from yellows [ibid., ix, p. 224] in Maryland, Pennsylvania, and Wisconsin (in proximity to diseased asters). The symptoms of the disease on this host are depicted in a plate.

A list of over 30 hosts of cedar blight (*Phomopsis juniperovora*) [see above, p. 71] is given, together with a plate showing the effects of the disease on *Juniperus virginiana*. Field and greenhouse inoculations have shown that the Woodgate rust (*Peridermium* sp.) of Scotch pines (*Pinus sylvestris*) [ibid., ix, p. 500] is transmissible to twelve other species of *Pinus*, which are enumerated.

Stunt and mosaic of dahlias [ibid., ix, p. 509] are becoming increasingly troublesome, being reported during 1929 from five States. Mosaic of iris [ibid., ix, p. 628] was very prevalent along the Pacific Coast from Washington to California, especially in the more southerly regions, where some stocks that had been five to six years in the country showed 100 per cent. infection. On the other hand, stocks recently imported from Holland showed little or no infection. *Lilium* spp. in Indiana and Maryland were attacked by *Phytophthora cactorum* [ibid., v, p. 430].

GARDNER (M. W.) & MAINS (E. B.). **Indiana plant diseases, 1928.**—*Proc. Indiana Acad. Sci.*, xxxix (*1929*), pp. 85-99, 6 figs., 1 graph, 1930.

The following are a few of the many items of interest in this survey of the prevalence of plant diseases in Indiana during 1928. Apple blotch (*Phyllosticta solitaria*) was extremely severe. Observations at Mitchell showed that infection occurred during each of the 23 rainy periods between 8 days and 10½ weeks after petal fall (9th May), while at Lafayette it took place in 22 out of 23 rains between 4 days and 9½ weeks after petal fall (14th May).

Bacterial spot of peaches (*Bacterium pruni*) [*R.A.M.*, ix, p. 580] caused very severe fruit infection and early defoliation. The lesions on the twigs were unusually elongated and irregular in shape; microscopic examination of shaved cankers revealed an active exudation of bacteria along the cut edges. Good control of this disease was obtained at Vincennes by spraying with zinc sulphate and lime. The Krummel variety seems to be more resistant to leaf infection than the Hale.

Perithecia of the black knot organism (*Plowrightia morbosa*) [*Dibotryon morbosum*: ibid., ix, p. 116], containing apparently ripe ascospores, were found on Blue Damson plums on 3rd April.

Angular leaf spot of beans [*Phaseolus vulgaris*], caused by *Isariopsis griseola* [ibid., viii, p. 423], occurred at Lafayette. Forty commercial varieties proved susceptible to the fungus in greenhouse inoculation tests, only the Kentucky Wonder showing a certain degree of resistance.

Downy mildew (*Peronospora manshurica*) of Manchu soy-beans [ibid., ix, p. 289] was observed for the first time in the State.

Additional evidence of the introduction of the tomato leaf spot fungus (*Septoria lycopersici*) with southern-grown plants was

obtained [cf. ibid., iii, p. 381]. The estimated loss in the State from early infection by this disease in 1928 was over $100,000. *Aplanobacter michiganense* [ibid., x, p. 52] was found on southern-grown tomatoes, this being the first report of the organism in Indiana.

Speckled leaf blotch of wheat (*Septoria tritici*) [see above, pp. 77, 82] was unusually prevalent and caused considerable defoliation. The Marquillo variety was highly susceptible and Illinois No. 1 somewhat resistant.

White Matchless carnations were severely injured by leaf spot due to *Bacterium woodsii*.

VAN HOOK (J. M.). **Indiana fungi, XII.**—*Proc. Indiana Acad. Sci.*, xxxix (*1929*), pp. 75–83, 1930.

Among the numerous interesting records in this list of Indiana fungi the following may be mentioned. *Lilium regale* seedlings suffered extensively from damping-off due to *Pythium de Baryanum*, which was controlled by sprinkling sulphur on the soil.

The conidial stage of *Microsphaera alni* is prevalent every year on the leaves of *Euonymus atropurpureus*.

Polyporus hispidus [*R.A.M.*, ix, p. 429] was found on a dying *Acer rubrum* tree in 1928 and 1929. The fungus was fruiting abundantly and probably accelerating the death of the tree.

Clover (*Trifolium pratense*) and *Medicago lupulina* were attacked in 1929 by *Cercospora zebrina* [ibid., ix, p. 319], which is characterized by tufted, amphigenous conidiophores, brown at the base with hyaline tips, 25 to 60 by 3 to 4 μ, and hyaline, straight or curved, long-tapering conidia, 30 to 160 by 3 to 5 μ. The spots produced on the leaves of *M. lupulina* are black with yellow borders, and measure 4 to 5 mm. across, while on the stems they appear as elongated, discoloured areas which coalesce and cover the whole stem; the leaves shrivel and fall, and the stems are killed.

Department of Botany.—*Forty-third Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1930* (*Bull.* 258), pp. 23–25, 1930.

Among the items of information contained in this report [which is on the same lines as those for previous years: *R.A.M.*, ix, p. 160], the following are of phytopathological interest. The principal new material tested in continued spraying and dusting experiments for the control of apple scab [*Venturia inaequalis*: ibid., viii, p. 90] was calcium monosulphide spray which, in severely infected plots of Stayman apples, reduced the percentage of scabbed fruit from 79 in the checks to 10·2; an almost equal degree of control (10·3 per cent. scabbed fruit) was obtained with colloidal sulphur dust, but the cleanest plots were those that were treated with the standard lime-sulphur spray (2·2 per cent. scabbed apples).

Considerable attention was again given to the propagation and testing of apple and pear seedlings resistant to fireblight [*Bacillus amylovorus*]. A number of pear varieties which have been reported by local growers to be apparently resistant to the disease

are being propagated and tested, and a study of the comparative anatomy of the most resistant and most susceptible varieties is in progress.

Six selections of native potato stocks which have been under cultivation for many years were exposed to infection with virus diseases, and two of them were found to show some promise of inherent resistance.

Continued investigation of tobacco wildfire [*Bacterium tabacum*] confirmed the fact that in Pennsylvania the causal organism readily overwinters in the open in tobacco refuse, in soil, or on seed-bed sashes. Soil sterilization of the seed-beds, the use of new cloth, frames, and the like, did not give adequate control, but the removal of the seed-beds to new sites was in several cases effective in eliminating the disease. In artificially infected seed-beds the development of wildfire was effectively prevented by a weekly application of 1–1–50 Bordeaux mixture at the rate of 1 qt. per sq. yd.; calomel [mercurous chloride] applied at the rate of 1 gm. per sq. yd. was also effective. Experiments also showed that tobacco plants grown under muslin canopies remain free from the disease.

A brief indication is given of the lines on which the project of studying the more important timber-rotting fungi and the decays produced by them is being developed.

Forty-second Annual Report of the Kentucky Agricultural Experiment Station for the year 1929. 52 pp., 1930. [Received October, 1930.]

In the section of this report dealing with tobacco diseases (pp. 15–18) [cf. *R.A.M.*, ix, p. 21] it is stated that greenhouse tests have confirmed field observations to the effect that liming induces frenching [ibid., viii, p. 473; ix, p. 810]. Turkish tobacco invariably became frenched when grown in soil from the lime or lime and superphosphate plots in the experimental fields, while there was no disease in soils from unlimed plots. When the P_H value of the medium was between 5 and 6, Turkish tobacco in sand or water cultures in the greenhouse did not french even with deficient available nitrogen, phosphorus, magnesium, or iron.

A study of what is considered to be rugose mosaic of Irish Cobbler potatoes [ibid., ix, p. 402] indicated that two viruses are concerned, one of which, the 'healthy potato' virus, is always present in this variety, while the other, commonly present in tobacco grown in soil previously sown to potatoes, causes veinbanding [ibid., x, p. 60]. A mixture of both causes a severe necrotic disease of tobacco identical with that produced when tobacco is inoculated directly from mosaic potatoes. Cobbler potatoes inoculated with the veinbanding virus developed a severe, usually fatal, necrotic disease. Seeding potatoes inoculated with the 'healthy potato', together with the veinbanding, virus, developed a similar condition, plants from tubers of the inoculated plants showing typical rugose mosaic in both cases.

Veinbanding, etch, etch +, and severe etch [loc. cit.] each produce in seedling potatoes a disease characterized by faint mottling and rugoseness, with some distortion. These viruses may be retrans-

ferred to tobacco, are carried in certain weeds, and are considered to be a factor in the potato degeneration problem.

What appeared to be true tobacco ring spot [loc. cit.] was transferred to tobacco from naturally infected Irish Cobbler potatoes showing a yellow and green mottling resembling that seen in aucuba mosaic [ibid., vi, p. 311; ix, pp. 123, 483, 738]; the condition is distinct from the so-called 'ring spot' transferred from 'healthy potatoes', which is, apparently, the 'healthy potato' virus disease. Evidence was obtained of the seed transmission of the tobacco ring spot virus. Several seedlings from plants raised in the greenhouse from seed from a plant inoculated with ring spot developed a chlorosis towards the distal end of the leaf borders, which sometimes caused the tip of the leaf to appear pinched. Transfers from these plants to healthy tobacco produced typical ring spot.

Fortieth Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1929.—37 pp., [? 1929.] [Received November, 1930.]

This report contains the following items of phytopathological interest. H. B. Tisdale reports the development of some improved strains of the Cook 1627, Cook 1010, Bottoms, and Cook 307-6 cotton varieties resistant to wilt [*Fusarium vasinfectum*: *R.A.M.*, viii, p. 718].

W. A. Gardner states that Nancy Hall and two other [unnamed] varieties of sweet potato proved completely resistant in a series of inoculation experiments with the black rot organism [*Ceratostomella fimbriata*: ibid., ix, p. 336], while Dooley, Jersey Sweet, and five others [unspecified] were highly susceptible.

Agricultural experiments 1929.—*New Hampshire Agric. Exper. Stat. Bull.* 250, 31 pp., 4 figs., 1 diag., 1930.

The following items of phytopathological interest occur in this report. In 1928, for the first time for several years, O. Butler found four sprayings to be necessary for the commercial control of apple scab [*Venturia inaequalis*: *R.A.M.*, viii, p. 45], the production of A-grade fruit from the trees sprayed three times being only 25 per cent. compared with 66 from those given four applications of lime-sulphur 1 to 50.

O. Butler has further ascertained, as a result of five years' experiments at Colebrook and East Kingston, that a low mean daily temperature is favourable to the development of potato mosaic [ibid., ix, p. 475], and a high mean daily temperature unfavourable. A high mean daily temperature accompanied by periods during which the temperature is above 25° C. causes a masking of mosaic symptoms, the number of hours the temperature remains above 25° being particularly significant when the mean daily temperature for the growing season is above 17°. Leaf roll was effectively prevented on Irish Cobbler plots by early harvesting. In 1928 an experiment was started to determine the value of early harvesting in checking the subsequent development of leaf roll in Green Mountain potatoes. The original stock planted produced plants showing 6·40 per cent. mosaic and 0·56

per cent. leaf roll. The field was thoroughly rogued after the first inspection. Potatoes harvested 81 days after planting showed no mosaic and 6·9 per cent. leaf roll in the progeny; at 90 days no mosaic and 3·29 per cent. leaf roll; at 101 days no mosaic and 2·19 per cent. leaf roll; at 110 days 0·24 per cent. mosaic and 1·41 per cent. leaf roll; and finally, at 143 days, 0·21 per cent. mosaic and 21·27 per cent. leaf roll. At Northwood stock was grown in 1927 that showed an average of 2·78 per cent. leaf roll and no mosaic before roguing. Before planting in 1928, 39·3 per cent. of the tubers were removed on account of leaf roll. The remaining, presumed healthy seed, was planted, and at the first inspection showed 1·59 per cent. mosaic and 35·63 per cent. leaf roll.

DURRELL (L. W.). **Report of the Botanical Section.**—*Forty-second Ann. Rept. Colorado Agric. Exper. Stat. for the year 1929*, pp. 24–30, 1929. [Received June, 1930.]

The following items of phytopathological interest occur in this report. E. L. Le Clerg first detected the occurrence of pink-root of onions [*Phoma terrestris*: *R.A.M.*, ix, p. 621] near Littleton in 1928, and during the past season it was found in isolated fields near Cañon City and Rocky Ford, sometimes causing complete loss of the crop. Infection appears to have been introduced into the State on Bermuda sets from Texas. Purple blotch, an onion disease of fungous origin associated with continuous cultivation, is estimated to have caused a loss of 10,000 lb. per acre in one field near Rocky Ford. *Fusarium* bulb rot [ibid., ix, p. 155] was also found in two fields of onions in the same locality.

MATSUMOTO (T.). **Further studies on some putrefactive phytopathogenic bacteria by agglutinin absorption.**—*Journ. Soc. Trop. Agric. Formosa*, ii, pp. 16–25, 1930. [Japanese summary.]

Previous studies showed that [*Bacillus* sp.] No. 216, a causal organism of the soft rot disease of 'pe-tsai' [*Brassica pekinensis*: *R.A.M.*, ix, p. 24], is closely related serologically to Nos. 212 and 197, isolated from melon and *Zinnia elegans*, respectively, and less closely to No. 201 from radish, all in Formosa, Japan. In the present paper the results of further serological investigations on the relationships of these organisms are discussed and tabulated.

It was found that the 'pe-tsai' soft rot organism is most closely related antigenically to No. 204, isolated from tomato in Korea, with which it is indeed probably identical. An almost equally close connexion exists between it and No. 212 from melon. Agglutinin absorption tests showed the relationship between the 'pe-tsai' organism and Nos. 197 from *Z. elegans* and 201 from radish to be less close than was expected on the basis of cross tests with the antisera of these organisms. According to their serological reactions, the organisms from *Z. elegans* and radish are somewhat distantly related.

FISCHER (G. J.). **Orientaciones en la lucha contra las royas.** [Guiding lines in the campaign against rusts.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxix, 3, pp. 341–346, 4 figs., 1930.

The results of studies conducted by the Division of Plant

Genetics of the Argentine Ministry of Agriculture indicate that none of the wheats grown on a commercial scale in the Republic is immune from rusts (*Puccinia graminis, P. glumarum,* and *P. triticina*) [*R.A.M.*, v, p. 218]. The variety least susceptible to *P. triticina* appears to be 38 M.A., especially at an advanced stage of growth, while Lin Calel is very susceptible. The highest degree of resistance to *P. graminis* is exhibited by Kanred, while other naturally susceptible varieties may escape infection if the growing period is accelerated by early sowing. The 38 M.A. variety is liable to heavy damage from this rust when sown late. *P. glumarum* was observed for the first time in 1929, causing severe injury, especially to the Record variety; Lin Calel, 38 M.A., Sin Rival, Vencedor, and Kanred were apparently less susceptible. The new selections made by the Division of Genetics are stated to combine resistance to rust with marked precocity at any time of sowing.

GASSNER (G.) & STRAIB (W.). **Beitrag zur Frage der Getreiderostbekämpfung auf chemischem Wege.** [Contribution to the problem of cereal rust control by chemical methods.]—*Phytopath. Zeitschr.*, ii, 4, pp. 361–376, 1930.

The results of the writers' experiments in the control of brown and yellow rust (*Puccinia triticina* and *P. glumarum*) on Heine's Kolben and Dickkopf wheat, and of *P. dispersa* [*P. secalina*] on Petkus winter rye, by chemical methods, are described and tabulated. The tests were carried out mainly in the glasshouse, though some field experiments were also made.

Sulphur was applied as a dust, with and without an equal admixture of kaolin. It proved completely efficacious when given before or immediately after inoculation, but a delay of ten hours and upwards in the application of the sulphur destroyed its protective capacity.

Bordeaux mixture (1 per cent.) was effective when applied up to 24 hours after inoculation, but unlike sulphur it exercised no protective action when given 48 hours before inoculation.

Copper chloride (1 per cent.), applied shortly before and after inoculation, failed to prevent the development of the rusts and caused severe burning of the leaves, a manifestation which also followed the application of 10 per cent. iron sulphate.

Calcium cyanamide dust mixed with kaolin gave excellent protection (superior to that of sulphur), even when applied up to 24 hours after inoculation. It was, however, necessary to use large quantities of kaolin in order to prevent burning, and even at concentrations of 1 per cent. calcium cyanamide + 99 per cent. kaolin some injury was apparent. There was no difference between oiled and unoiled calcium cyanamide as regards the development of leaf injury [*R.A.M.*, vii, p. 499].

The application of basic slag and calcined lime dusts failed to control the rusts, while that of sodium nitrate (1 and 5 per cent. solutions) actually increased them.

Kainit, applied within 48 hours after inoculation either as a dust mixed with an equal quantity of kaolin or as a solution at varying concentrations up to 5 per cent., caused a considerable reduction

in the incidence of infection. This result is of interest in view of the satisfactory control of cereal rusts reported in recent experiments by the application of potash fertilizers [ibid., ix, p. 443].

In conclusion the writers discuss at some length the possibilities of applying calcium cyanamide for cereal rust control on an extended scale.

NIEVES (R.). **Ensayos comparativos de resistencia a la 'Tilletia laevis' (Kühn) con Trigos argentinos e importados, comunes y de pedigree.** [Comparative trials of resistance to *Tilletia laevis* (Kühn) with common and pedigree Argentine and imported Wheats.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxix, 3, pp. 297–316, 1930.

A detailed account is given of the author's investigations at the Guatraché Experiment Station on the reaction of 154 Argentine and foreign varieties belonging to 5 subspecies of wheat to bunt (*Tilletia levis*) [*T. foetens*: *R.A.M.*, ix, p. 584].

The seed-grain was contaminated shortly before sowing with spores of the smut collected the previous year on the Tuzela variety; it was sown on three different dates (30th April, 5th May, and 17th July) in plots measuring 15 by 15 cm. A very rigorous standard was observed in computing infection, the presence of one diseased spikelet being sufficient to place the entire ear in the infected class.

The results of the trials [which are tabulated and discussed] indicated that the conditions most favourable to infection occur in the autumn sowings (April and May in the Argentine) of winter wheat [cf. ibid., vi, p. 660]. The maximum intensity of infection was recorded in plants germinating in soil becoming progressively drier in the absence of rain. Thus, plants of the Florence variety sown in May and receiving no moisture during germination showed 17·5 per cent. infection, compared with only 7·2 per cent. for the sowings made in April, when 6 mm. of rain fell at the corresponding stage of development. Infection was least abundant at very low soil temperatures (6° to 7° C.), which occur during June and July in the region under observation [cf. ibid., x, pp. 17, 19]. In 1929 even the highly susceptible Record Klein variety showed marked resistance to bunt owing to the regular though slight rainfall during the germination period.

Great extremes of variability in resistance to bunt were manifested by the different varieties of *Triticum vulgare* used in the tests, ranging from 100 per cent. infection in awned Russian, Tuzela, and Lin Calel to virtual immunity (0·15 per cent. infection or less) in the new selections 146–183-cDG, K–01–28 Cheg, &c. The majority of the very resistant new lines are members of the sub-group *T. vulgare* var. *erythrospermum*, consisting of awned winter wheats originating in Hungary and Kansas, but a high degree of resistance was also shown by some lines of *T. vulgare* var. *albidum*, e.g., Florence, and of *T. vulgare* var. *ferrugineum*, e.g., K–09–26.

Comparing his results with those obtained by Tapke in respect of resistance to loose smut (*Ustilago tritici*) [ibid., ix, p. 170], the writer found a correlation between the reaction of a number of

varieties to this disease and bunt. Generally speaking, the varieties immune from, or highly resistant to, loose smut behave similarly with regard to bunt, while those susceptible to *U. tritici* are also severely attacked by *T. foetens*. Discrepancies in the results obtained in different localities may be attributed to the influence of environmental conditions, the possible existence of physiological forms of the fungus, or the mode of experimental infection.

Hiltner (E.) & Tornow (Elisabeth). **Über die Beizwirkung von Trockenbeizmitteln während der Lagerung gebeizten Getreides (Lagerbeizwirkung).** [On the disinfectant action of dusts during the storage of treated seed-grain (storage disinfectant action).]—*Angew. Bot.*, xii, 5, pp. 352–361, 1930

Continuing their investigations on the control of wheat bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, ix, p. 707], the writers compared the after-effects or secondary action of various dusts on stored seed-grain [cf. ibid., vi, p. 279]. The method devised by the junior author [ibid., ix, p. 637] was found satisfactory for this purpose.

The results of the trials [which are discussed and tabulated] showed that the dusts tutan, tillantin, and preparation 844 (dry fusariol) exert, in addition to their typical secondary action manifested after the seed-grain is sown, a considerable degree of fungicidal activity during storage for some days before sowing, even in atmospheric humidities of less than 25 per cent. and a water content of the grain of not more than 14 per cent. These preparations, therefore, may be relied upon to destroy the bunt spores, even under unfavourable weather and soil conditions, where one to two days are allowed to elapse between treatment and sowing. This is not the case, however, with abavit B and ceresan, the action of which is not increased by a delay between treatment and sowing.

The authors' experiments clearly indicate that certain dusts, represented in this case by tutan, 844, and tillantin, require a definite period of storage to develop their full fungicidal efficacy.

Dillon Weston (W. A. R.). **Ineffective nature of iodine dust as a fungicide against Tilletia caries.**—*Phytopath.*, xx, 9, pp. 753–755, 1930.

The results [which are tabulated] of a series of tests in the control of wheat bunt (*Tilletia caries*) on the Little Joss variety at the Cambridge School of Agriculture in November, 1928, and March, 1929, showed that iodine dust (1·5, 3, and 5 per cent.) [cf. *R.A.M.*, x, p. 22] is useless for this purpose. Copper carbonate dust (2 oz. per bushel) gave satisfactory results [ibid., viii, p. 494].

Gram (E.). **Syg og sund Vintersæd.** [Diseased and healthy winter seed.]—*Ugeskr. for Landmaend*, lxxv, 37, pp. 580–581, 1930.

In the course of a brief popular survey of current conditions with regard to the seed-borne diseases of cereals in Denmark, mention is made of the efficacy of sanagran VIII [*R.A.M.*, viii, p. 95] and dahmit in the control of this type of infection. Both

are mercury preparations, the former supplied in the form of a reddish. gritty powder, and the latter as a solution.

Further confirmation of the transmission of the foot rots of cereals [*Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, *Fusarium culmorum*, and other organisms: ibid., ix, p. 741] through the soil has been obtained. The incidence of infection by these fungi was experimentally shown to be increased by a deficiency of nitrogen in the fertilizer.

MØLLER (P.). **Om Fodsyge og Lyspletsyge.** [On foot rot and grey speck disease.]—*Ugeskr. for Landmaend*, lxxv, 38, pp. 603–604, 1930.

Referring to Gram's observations on the foot rots of cereals [*Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, *Fusarium culmorum*, and other fungi: see preceding abstract] in Denmark, the writer states that, in his experience, the presence of sufficiently large quantities of lime in the soil entirely inhibits the development of infection, irrespective of the sequence of the crops.

Grey speck of cereals [*R.A.M.*, ix, p. 741] also does not appear to occur on naturally pure calcareous soils, whereas the addition of lime to sandy or clay soils fails to prevent the occurrence of this disease. Possibly, therefore, the condition is due rather to the physical structure of the soil than to its reaction.

PAPE (H.). **Getreidehalmwespe (Cephus pygmaeus L.) und Fusskrankheit ('Halmtöter') des Weizens.** [Cereal stem saw-fly (*Cephus pygmaeus* L.) and foot rot ('haulm killer') of Wheat.] —*Deutsche Landw. Presse*, lvii, 36, p. 493, 1 col. pl., 1930.

Attention is drawn to the similarity and consequent likelihood of confusion between the symptoms caused by the cereal stem saw-fly (*Cephus pygmaeus*) and those of foot rot (*Ophiobolus* [*graminis*], *Leptosphaeria* [*herpotrichoides*], and *Fusarium* spp.) [*R.A.M.*, ix, p. 586] on wheat and other cereals in Germany.

MAINS (E. B.), VESTAL (C. M.), & CURTIS (P. B.). **Scab of small grains and feeding trouble in Indiana in 1928.**—*Proc. Indiana Acad. Sci.*, xxxix (*1929*), pp. 101–110, 4 figs., 1930.

Scab (*Gibberella saubinetii*) is estimated to have caused losses of 15, 20, and 3 per cent., respectively, in the wheat, barley, and oat crops of Indiana during the season of 1927–8. In a series of feeding experiments [full details of which are given], hogs found scabby barley so unpalatable that they ate scarcely enough to maintain life [*R.A.M.*, ix, p. 643]. It can, however, safely be given in small amounts (probably not exceeding 10 per cent. of the total ration). Barley containing up to 58 per cent. of scab was successfully fed to cattle as 50 per cent. of the grain ration, and was utilizable to the extent of 20 per cent. of the poultry ration. Some indications are given on the control of the disease by cultural measures and the use of resistant varieties.

FERRARIS (T.). **Mal bianco degli steli di Grano.** [White straw disease of Wheat.]—*Rivista Agricola*, xxvi, 594, pp. 407–408, 1930.

A brief account is given in popular terms of white straw disease

of wheat (*Gibellina cerealis*) [*R.A.M.*, viii, p. 432] which occasionally appears in Italy during May, affecting chiefly the lower parts of the culms, on which it produces round or oblong, isolated or confluent, white, felt-like spots with a conspicuous dark rim. Later, the spots merge into a single longitudinal lesion, the whitish part of which consists of a thick velvety layer showing, towards the end of May, numerous black perithecia.

The mycelium is found superficially as well as in the leaf sheath tissues, and between the sheath and the culm. Affected plants wilt and dry up at the moment of emission of the ear.

Tests showed that the ascospores of *G. cerealis* take a rather long time to mature and require to remain in the soil for a year before they can produce infection, with the result that, as crop rotation is nearly everywhere practised in Italy, the disease is rare and does not appear likely to become more prevalent. Other cereals are apparently unaffected.

MACRAE (N. A.). **Preliminary report on studies of loose smut of Barley.**—*Proc. Canadian Phytopath. Soc., 1929*, pp. 44–47, 1 diag., 1 graph, 1930.

Brief notes are given on the preliminary results of the author's investigations on the biology of *Ustilago nuda*, stated to be the most important barley smut in Canada [*R.A.M.*, ix, p. 297]. Germination tests of Quebec material conducted in October showed that early maturing spores (5th and 20th July) were less viable than those maturing late (4th and 17th August). Contrary to the observations of other workers, the writer's studies indicated that germination is more profuse when the spores were agglutinated than when they were isolated or thinly scattered. The optimum hydrogen-ion concentration for spore germination in an extract of pales and distilled water was found to range from P_H 5 to 5·4, with a secondary optimum at 6·8 to 7·2 and an isoelectric point between 5·5 and 6. The optimum temperature for the germination of *U. nuda* spores from 11 different sources ranged from 20° to 22° C. After 4 days' incubation in sterile distilled water the percentage of germination was much higher than after 48 hours.

HAARRING (F.). **Beizmittelprüfung an Haferflugbrand im Laboratorium mit der 'Leipziger Methode'.** [Testing of fungicides against loose smut of Oats in the laboratory by the 'Leipzig method'.]—*Pflanzenbau*, vii, 3, pp. 89–92, 2 figs., 1930.

The writer has found Rösch's 'Leipzig method' [*R.A.M.*, vi, p. 108] for testing fungicides against loose smut of oats [*Ustilago avenae*] very effective in laboratory and field experiments. By the microscopic examination of the coleoptile epidermis of 50 seedlings (instead of 20 as indicated by Rösch) it was possible to follow all the gradations of efficacy, according to concentration and duration of treatment, in the various liquid preparations and dusts tested. The results of laboratory trials on these lines were fully borne out by parallel field experiments during 1928–9.

CLAUSEN. **Reaktionen des Hafers auf die Säurengrade im Boden.** [Reactions of Oats to degrees of soil acidity.]—*Deutsche Landw. Presse*, lvii, 37, p. 506, 1930.

The results [which are tabulated and discussed] of observations on the reaction of oats to varying soil treatments at Heide (Holstein) showed that the adverse effects of liming (expressed in the development of grey speck) [*R.A.M.*, viii, p. 304] do not become strongly marked for some six years after a single application of the lime, the first signs not being visible until after three or four years. It was further shown that the ill effects of liming can be counteracted to a great extent by autumn applications of stable manure. The soil acidity disease [ibid., iii, p. 342] occurred on all the plots receiving artificial fertilizers without lime, but here again a noticeable reduction in the incidence of the disease followed the use of stable manure.

FERDINANDSEN (C.) & WINGE (Ö.). **A heritable blotch leaf in Oats.**—*Hereditas*, xiii, 2–3, pp. 164–176, 2 col. pl., 3 figs., 1930.

A full account is given of a spot necrosis ('blotch leaf') in a Norwegian variety of oats which has been cultivated for a number of years at the Swedish and Danish Experiment Stations (from 1910 to 1925 at Lyngby, Denmark). The symptoms, which occur on practically every plant of the variety in question, consist of greenish-brown, diffuse spots, later turning pale to nut-brown, with a reddish-brown tinge, or pale greyish. The faded areas are surrounded by a distinct mahogany- to purple-brown zone, which is specially conspicuous on the lower surface. Some leaves bear only a few elongated spots, 0·5 to 2 cm. long, while on others the numerous lesions are often merged in the form of stripes. The brownish colour of the spots and their irregular distribution serve to differentiate blotch leaf from grey speck [see preceding abstract]. Where the reddish-brown spots occur separately on the leaf they may recall the advanced stages of infection by *Septoria avenae* [ibid., ix, p. 625], but the vivid crimson colour produced by the latter is absent in blotch leaf.

The results of hybridization experiments in which the blotched variety was crossed with healthy Segerhavre oats indicated that the condition is transmissible (mainly through the ovules but also to some extent by the pollen) to the progeny and thence, by selection of heavily blotched individuals, to succeeding generations. The segregation ratios in the F_2 and following generations are very variable and do not accord with the Mendelian numerical relations, so that the hereditary element cannot be associated with the chromosomes; in all probability it is connected with the plastids of the affected variety.

The possibility of a virus being implicated in the causation of blotch leaf appears to be excluded by its complete absence of infective capacity, as it never spreads to other varieties even in close proximity; by the necrotic condition produced by it; by its transmission through the seed; and by the failure of experiments in its transmission by aphids.

To the authors' knowledge, the only other reference in phyto-

pathological literature to a condition analogous with blotch leaf of oats is R. A. Emerson's 'The inheritance of leaf blotch in Maize' (*Cornell Agric. Exper. Stat. Mem.* 70, 1923). However, the available data indicate that the oat disease differs in that it cannot be explained by inheritance on the ordinary Mendelian lines masked by incomplete relations of dominance.

BALTZER (U.). **Untersuchungen über die Anfälligkeit des Roggens für Fusariosen.** [Investigations on the susceptibility of Rye to fusarioses.]—*Phytopath. Zeitschr.*, ii, 4, pp. 377–441, 11 figs., 6 graphs, 1930.

This is a very detailed account, accompanied by numerous tables, of the author's investigations on the susceptibility of 57 varieties and 300 strains of rye to *Fusarium nivale* [*Calonectria graminicola*] and *F. culmorum*, stated to be the principal agents of rye fusariosis in Germany [*R.A.M.*, vii, p. 505; viii, p. 31; ix, p. 174, *et passim*].

C. graminicola could seldom be induced to sporulate either on natural or artificial media. In greenhouse tests the addition of sterilized oat groats to the medium increased the infective capacity of both fungi. The incidence of infection by *F. culmorum* increased with rising temperatures, but this did not appear to be the case with *C. graminicola*. The latter organism was found in these investigations to behave as a facultative parasite, attacking only such plants as were already weakened by some other agency.

The greenhouse inoculation tests with *F. culmorum* were carried out as follows. The seed-grain was immersed for 20 minutes in a conidial suspension, lightly dried, laid on a layer of sand in pots half filled with compost soil, and covered with a layer of sand and oat groats soaked in a conidial suspension of the fungus. The average temperature was 20° C. and the relative humidity 80 per cent. The incidence of infection by this fungus among the 57 rye varieties generally ranged from 60 to 85 per cent The most resistant was the Eckersdorfer W. (36·5 per cent.), followed by Volga R., Seigle de pays 1 and 2, and Petkus (under 55 per cent.), while Frhr. v. Wangenheim and Finnischer Bachos proved exceptionally susceptible (up to 95·5 and 96 per cent., respectively). There is thus no indication of any natural selection for resistance to *F. culmorum*, but the artificial selection and isolation of resistant individuals under controlled conditions led to a reduction of infection in a number of varieties.

No correlation could be traced between the germinative capacity of the seed-grain and *Fusarium* infection.

Steeping in germisan or uspulun and dusting with abavit were only partially successful in the control of rye fusariosis, the fungicidal treatment apparently conferring a certain protection against attack from the seed-grain but not preventing infection through the soil.

It was found possible to infect rye with *F. culmorum* through the haulm. Inoculation is most likely to be successful during the flowering period; with advancing maturity the incidence of infection declines. Dusting the ears with a conidial suspension failed to induce infection, but their immersion in the inoculum proved to

be an excellent substitute for the laborious method of single flower inoculation.

RANKER (E. R.). **Synthetic nutrient solutions for culturing Ustilago zeae.**—*Journ. Agric. Res.*, xli, 6, pp. 435–443, 1 graph, 1930.

After indicating the drawbacks of the various nutrient media (decoctions, extracts, or infusions of plant parts or plant products) generally used for culturing *Ustilago zeae*, especially in the biological study of the fungus and of its physiological forms [*R.A.M.*, ix, p. 713], the author gives details of experiments with nine separate strains of *U. zeae* on 26 synthetic media, the composition of which is indicated. The most satisfactory among these was shown to be a nutrient solution (No. 7) of the following composition: 0·3 gm. K_2SO_4, 0·1 gm. NH_4NO_3, 0·1 gm. $CaCl_2$, 0·1 gm. $Mg_3(PO_4)_2{\cdot}4H_2O$, 10 gm. dextrose, distilled water to make 1 litre. This solution may be solidified by the addition of agar.

The chief advantages of this medium are that when the constituents are added there is practically no precipitate formed and the resulting hydrogen-ion concentration is favourable to growth of the fungus (P_H 7·4 before and 5·6 after sterilization). This allows of keeping the total concentration of the solution at a constant level, and also facilitates accurate duplication, since the reaction of the solution need not be adjusted. It is pointed out, however, that for some physiological forms of *U. zeae* maltose may be more suitable than dextrose.

KYLE (C. H.). **Relation between the vigor of the Corn plant and its susceptibility to smut (Ustilago zeae).**—*Journ. Agric. Res.*, xli, 3, pp. 221–231, 1930.

Details are given of experiments from 1925 to 1927, inclusive, at the Arlington Experiment Farm, Rosslyn, Virginia, in which selfed lines of maize and F_1 crosses between these lines were studied for the purpose of determining the existence or otherwise of a correlation between the vegetative vigour of the plants (as measured by the relative size or weight of the total growth produced in an average unit of time, or by the weight of grain produced by plants requiring approximately the same time to mature) and their relative susceptibility to smut (*Ustilago zeae*) [*R.A.M.*, ix, p. 373]. The results [which are fully discussed] showed a clearly defined tendency for the vigour of the maize plants to be directly related to the number of ears that became smutted, and this independently of whether the relative vigour of the plants was due to individual variations within the lines or crosses, or to genetic differences between the crosses and their selfed parents, or was influenced by differences in environmental and cultural conditions. There was also evidence of a direct correlation between the percentage of water in immature maize plants, on the one hand, and their rate of growth and susceptibility to smut infection, on the other.

From a practical point of view, the author considers that in selecting smut-resistant selfed lines of maize it should be borne in mind that in some cases resistance to smut may be due to lack of vigour, and that the use of such strains may result in lower yields.

EDDINS (A. H.). **A new Diplodia ear rot of Corn.**—*Phytopath.*, xx, 9, pp. 733–742, 4 figs., 1930.

This is an expanded account of the ear rot of maize in Florida caused by *Diplodia frumenti*, preliminary notes on which have already been published [*R.A.M.*, ix, pp. 375, 712].

Of the three other recorded species of *Diplodia* which were shown by the author's experiments to produce a rot of maize and other crops similar to that caused by *D. frumenti*, *D. natalensis* and *D. gossypina* are considered to be synonymous, with *Physalospora rhodina* [ibid., vi, p. 127] as their perfect stage, while *D. tubericola* is tentatively regarded as distinct from these and from *D. frumenti* [ibid., iii, p. 271]. All have similar pycnidial stages, but the author considers it best to keep *D. tubericola* and *D. frumenti* separate so long as their perfect stages are not known. The spores of *D. frumenti* germinate best at 25° to 32° C. The optimum temperature for the growth of the fungus on potato-dextrose agar is 25° to 32°, the most favourable hydrogen-ion concentration lying between P_H 4·9 and 8·2.

D. frumenti enters the ears through the exposed tips and wounds and by growing into the ears at the butt ends. The fungus hibernates in old maize stalks in the field and as dormant mycelium in the seed.

ROLDAN (E. F.). **Note: the occurrence of Pythium root-rot disease of Maize and Sugar Cane in the Philippine Islands.** —*Philipp. Agric.*, xix, 5, p. 327, 1930.

A species of *Pythium* was consistently isolated from the water-soaked, flaccid, decayed roots of young and nearly mature maize plants affected by root rot at the Philippine College of Agriculture in October, 1929 [cf. *R.A.M.*, ix, p. 682]. The disease was reproduced on maize seedlings grown in sterilized soil in pots by inoculation with a pure culture of the fungus from steamed maize meal.

Root rot due to *Pythium* sp. was also observed on sugar-cane plants at the College in March and July, 1930, a previous attack having occurred in 1926. The diseased canes were pale yellow and stunted and most of the rootlets were rotten. The inoculation of single-node cuttings of the susceptible Luzon White variety with a pure culture of the fungus gave positive results.

SMITH (C. O.) & FAWCETT (H. S.). **A comparative study of the Citrus blast bacterium and some other allied organisms.**—*Journ. Agric. Res.*, xli, 3, pp. 233–246, 3 pl., 1 fig., 1930.

After giving a brief outline of the history and geographical distribution of *Bacterium* [*Pseudomonas*] *citriputeale* [*R.A.M.*, viii, p. 554; ix, p. 645], *Bact.* [*P.*] *cerasi* [ibid., iv, p. 488], and *Bact.* [*P.*] *syringae* [ibid., viii, p. 635], the authors state that, when studied in parallel cultures [details of which are given], the three organisms showed a close agreement in their cultural and biochemical characters. A close agreement was also found in the pathogenicity of the three species on various organs of a large number of hosts, including avocado pear (*Persea americana*) *P. gratissima*], lilac, citrus, and apricot, with the exception of

P. cerasi on apricot stems, on which it formed dark lesions 20 to 30 mm. or more long, instead of the small lesions and local gumming caused by the other two species. When inoculated into lemon fruits all three organisms produced lesions which agreed well in size and other features at temperatures from 17° to 20° C., but at 29° to 31° the *P. citriputeale* strains differed sharply from the others in the larger size of the resulting lesion.

While these results suggest a close relationship between the three organisms, present knowledge is not considered by the authors sufficient to warrant placing them in a single species; if this should be done, *P. syringae* would be the correct scientific name on the ground of priority. It is also pointed out that although *P. citriputeale* from citrus and from avocado have similar general cultural characteristics, the two strains show some differences in their pathogenicity which suggest that they may not belong to the one species.

LOUCKS (K. W.). **Some physiological studies of Phytomonas citri.**—*Journ. Agric. Res.*, xli, 3, pp. 247–258, 1 fig., 2 graphs, 1930.

Details are given of experiments in 1927 and 1928 at the Florida Agricultural Experimental Station with a view to ascertaining the environmental conditions under which *Phytomonas* [*Pseudomonas*] *citri* [*R.A.M.*, ix, p. 175] can live in a more or less active state of growth. When grown in potato broth at temperatures ranging from 11° to 34·5° C., the rate of increase of population of the organism was found to be greater at the higher than at the lower temperatures, with an optimum between 29·5° to 34·5° for early growth; at the end of 10 to 14 days, however, the population was approximately the same at all the temperatures tested in a given series of experiments. In cultures kept at 28° *P. citri* was dead at the end of 40 days, but in cultures at lower temperatures it remained viable for 57 days. The rate of starch digestion by the organism was found to increase with a rise of temperature up to 28°, after which it decreased; there was no evidence of a correlation between change in P_H values caused by the growth of the organism in the culture medium and rise or fall of temperature.

In further tests to establish the longevity of *P. citri* in soil, the organism died out after 13 days in unsterilized Florida muck soils and after 6 days in unsterilized sandy soils, but persisted for at least 150 days in inoculated sterilized preparations of both muck and sandy soils at room temperature. There was apparently no correlation between the longevity of *P. citri* in sandy soil and the percentage of moisture in the soil.

BLATT (R. J.). **Trunk diseases in Citrus.**—*South African Fruit Grower*, xvii, pp. 197–200, 6 figs., 1930.

Brief popular notes are given on the three commonest trunk diseases of citrus in South Africa, viz., a condition (the cause of which has not yet been determined) frequently known as collar rot but resembling both Florida collar rot [*Phytophthora parasitica*] and Californian gummosis [*P. citrophthora*], a root rot associated with a *Fusarium*, and scaly bark [psorosis].

In a typical case of the first disease, a young orange tree became wilted in less than a week; gum oozed from the base of the trunk; the bark was cracked, and apparently dead; the wood was discoloured and seemed to be saturated with gum; while most of the crown roots were dead. In the root rot disease no gumming was noted, but the trees suddenly wilted, the bark cracked, and many of the crown roots died. A *Fusarium* was isolated from the diseased roots. Psorosis spread very rapidly and the writer thinks there is no doubt that it must be due to some organism. A determined attempt to eradicate it is being made [*R.A.M.*, viii, p. 816].

KLOTZ (L. J.) & FAWCETT (H. S.). **The relative resistance of varieties and species of Citrus to Pythiacystis gummosis and other bark diseases.**—*Journ. Agric. Res.*, xli, 5, pp. 415–425 1930.

After a summary review of the recent literature on the relative susceptibility and resistance of different species and varieties of *Citrus* and allied genera to canker [*Pseudomonas citri*], West Indian lime anthracnose (*Gloeosporium limetticolum*), wither-tip (*Colletotrichum gloeosporioides*), verrucosis or scab (*Sphaceloma fawcettii*), psorosis, decorticosis [*Phomopsis californica*], and *Pythiacystis* (*Phytophthora citrophthora*) gummosis, the authors briefly discuss the results obtained by them in inoculation experiments in 1928 with the last-named organism on a wide range of species and varieties of these hosts at the California Citrus Experiment Station. The tests indicated that, in order to obtain dependable data on the response of the hosts to this form of gummosis, the inoculations should be made only on trees of the same age and growing under similar environmental conditions. Further, since great variations in the degree of susceptibility were shown by individuals of the same species or variety, and even at different points on the trunk of the same tree, it was found necessary to make several inoculations on each tree to arrive at a dependable average.

The results [which are presented in tabular form] showed that under the conditions of the experiments the varieties of the individual groups as a whole may be listed in the following descending order of susceptibility: lemon (*C. limonia*) citrange (hybrid), lime (*C. aurantifolia*), pomelo (*C. maxima*) and sweet orange (*C. sinensis*), mandarin (*C. nobilis*), rough lemon, tangelo (hybrid), sour orange (*C. aurantium*), and kumquat (*Fortunella* spp.). The widest variations in individual response to the disease was shown by the varieties of pomelo and citrange, the variations ranging from a susceptibility greater than that of lemon varieties to a resistance superior to the average in the sour orange group. The resistance exhibited by calamondin (*C. mitis*), *C. hystrix*, *C. limetta*, *C. ichangensis*, Sampson tangelo, and the Cunningham, Sanford, and Savage varieties of citrange was sufficient to justify their trial as possible rootstocks. In all the experiments the degree of susceptibility or resistance of the trees was measured by the size of the lesions which developed in 60 to 65 days after inoculation. It was also found that the amount of gum formed is approximately proportional to the severity and extent of the lesions.

Some details are also given of preliminary biochemical experi-

ments which were made further to test the suggestion of the senior author [ibid., vii, p. 259] that the degree of inhibition of the fungal enzymes by the bark of the hosts may be used as a test for disease resistance. The results, on the whole, substantiated the casual observations of many years as to the relative susceptibility of the hosts in the field, but several apparent anomalies indicate the necessity of continuing the work and of making thorough and extensive field tests.

RHOADS (A. S.). **Clitocybe root-rot of Grapefruit trees.**—*Plant Disease Reporter*, xiv, 17, p. 168, 1930.

Grapefruit trees on rough lemon stock in a 15-year-old grove at Lake Alfred, Florida, have recently been attacked by *Clitocybe tabescens* [*R.A.M.*, vi, pp. 460, 517]. Cultures from the roots yielded the rhizomorph-producing mycelium of the fungus. Numerous dead roots were found in the grove. A few of the trees exhibited lesions on the root crown, extending only a short distance above the ground line. Some of the trees under which old clusters of the mushrooms were found showed no sign of girdling above the ground level, but the tap roots were dead, and destruction of the lateral roots was in progress. The mycelium of the fungus developed between the bark and the wood and in the inner bark. This is believed to be the first record of the *Clitocybe* root rot on citrus. Like various other diseases occurring in Florida of recent years, the trouble was first confused with foot rot.

KILLIAN (C.) & MAIRE (R.). **Le bayoud, maladie du Dattier.** ['Baïoud', a disease of the Date Palm.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xxi, 6–7, pp. 89–101, 2 pl., 1 fig., 1930.

In this paper, which is the outcome of a mission to Morocco in 1927 supplemented by a further visit in 1930, the authors give a summary of the present knowledge of the date palm (*Phoenix dactylifera*) disease locally known as 'baïoud' [*R.A.M.*, iv, p. 347; viii, p. 565], the etiology of which is still obscure. The disease is stated to be of very long standing in the oases of south-eastern Morocco, and a similar, if not identical, disease is also very troublesome in the south-west of Algeria. The first symptom is the whitening of one leaf on a tree, the discoloration then progressing gradually from leaf to leaf, until the whole tree is involved and perishes, a process which may take a few weeks or as much as two years. Soon after the whitening of the leaf, a red and then brown discoloration appears in the fibro-vascular bundles of the rachis and petiole, which extends into the stem near the insertion of the affected leaf and may be traced a considerable distance down the stem. At the same time yellow spots appear in the tissues between the fibro-vascular bundles. These lesions are limited for some time to one side of the tree, but progressively involve the whole tree and the roots. The tissues of the young terminal bud acquire a bitter instead of a sweet taste.

The discoloured fibro-vascular bundles frequently contain the mycelium of a fungus which, in every case where it was isolated, proved to be the same species. On potato agar and malt agar it produces a white cottony growth (slightly pinkish in less vigorous

cultures), imparting a red colour to the substratum. The conidia, borne on hyaline, sparsely septate hyphae, are hyaline, cylindrical, tapering at both ends, slightly curved, continuous (rarely two-celled), 7 to 12 by 2 to 4 μ in diameter, and multiply by budding. Terminal or intercalary chlamydospores are also present; they are hyaline, more or less verrucose, for the most part continuous, with a relatively thin wall, and measure 9 to 17 by 8 to 12 μ. No other fructifications were observed, but in a seven-months-old culture small brown sclerotia developed. The fungus [a Latin diagnosis of which is given] is referred to the genus *Cylindrophora* and is named *C. albedinis* n. sp. ad int.

The point of entry of the fungus (the pathogenicity of which to the date palm was not tested) into the host tissues is not yet known. The fact that some trees with definite symptoms of 'baïoud' showed no lesions on their roots would indicate that the organism does not gain access through the roots, and in one case there was clear evidence that infection occurred at the apical portion of the stem which was scorched by the sun after an early morning frost. This observation leads the authors to believe that the disease may be spread by pruning instruments and may originate in wounds of the stem or leaf tissues.

Pending a fuller knowledge of the cause of the disease and the life-history of the organism, some measure of control might be attained by such measures as strict sanitation of date palm groves, the prohibition of the transportation of infected material from one oasis to another, and the growing of varieties such as 'Taâbdount' and 'Bou-slihan' which local experience has shown to be practically immune from the disease. According to the statement of the natives, the disease has spontaneously died out in the oases of the Drâa, where it was very destructive some fifty years ago; a possible explanation of this may be that all susceptible trees have been killed by the disease, the remaining ones being entirely immune from it, and, in this case, these oases may supply valuable resistant material for new plantations.

CEJP (K.). **Fusarium allescherianum P. Henn., parasit některých skleníkových rostlin.** [*Fusarium allescherianum* P. Henn., parasitic on certain glasshouse plants.]—*Ochrana Rostlin*, x, 3, pp. 75–77, 1 fig., 1930.

A brief account is given of a leaf spot of coffee plants grown under glass at Libochowitz [Bohemia], the causal organism of which was identified by the author as *Fusarium* [*Gloeosporium*] *allescherianum*. The spots usually start at the apex of the leaves and gradually extend downwards; the diseased tissues become brown, rapidly dry up, and finally drop out. When an infected leaf tip comes into contact with a healthy leaf, a spot is formed on the latter, a distinctive feature of such infections being their intense brown colour and the formation of a brownish-red border around the point of contact with the diseased leaf tip. The fructifications form small, rounded clusters, at first red, becoming brownish later, and either densely aggregated or dispersed. The conidia are cylindrical or fusiform, smooth, with rounded ends, and 15 to 20 by 4 to 5 μ in diameter; they are borne on erect, branched, fusiform

conidiophores. The fungus seems only to attack the fully developed, tough leaves, and was never seen on the younger, softer ones. The fructifications are seldom developed on the leaves while still on the plant, but usually appear in large numbers on detached leaves on the soil. The fungus is stated to be dangerous in that it weakens the host plant and predisposes it to attacks by secondary organisms which rapidly kill it. The only means of control recommended is the removal and destruction by fire of all infected leaves as they appear.

F. allescherianum was also found in a glasshouse in Prague attacking the leaves of *Boehmeria* spp., cacao, and *Cinnamomum zeylanicum*. The author believes that the fungus was introduced into Bohemia with coffee plants from the Sunda Isles.

LAMB (P. H.). **Annual Report on the Agricultural Department, Nigeria, for the year 1929.**—20 pp., 1930.

During the period under review further investigations were made in Nigeria into seed disinfection for the control of the bacterial disease of cotton (*Pseudomonas* [*Bacterium*] *malvacearum*) [*R.A.M.*, ix, p. 591], a small quantity of seed being exposed in an iron dish to the full rays of the sun daily for a fortnight, early in June. The temperature of the seed occasionally reached 60° C., which is above the thermal death point of the organism. The seed was subsequently sown for comparison with untreated seed, and the result obtained showed that the treatment had been completely successful, no sign of the disease appearing on the plants from the treated seed, though 40 per cent. of those from untreated seed became affected.

DASTUR (J. F.) & SINGH (J.). **A new Nematospora on Cotton bolls in the Central Provinces (India).**—*Ann. Myc.*, xxviii, 3–4, pp. 291–296, 22 figs., 1930.

A species of *Nematospora* was observed by the writers, for the first time in India, on specimens of diseased bolls from Nagpur, Central Provinces. Such bolls usually show distinct insect punctures, the lint below which is partially destroyed while that in the surrounding loculi is discoloured, the slight yellowish tinge of the early stages of infection ultimately turning sable-brown. The fungus was invariably found, chiefly in the ascigerous stage, in and on the discoloured fibres. Marsh's description of diseased cotton from Nyasaland [*R.A.M.*, v, p. 92] may well be applied to the Indian specimens, except that in the former case the walls of the hairs showed no discoloration, whereas in the latter not only the central canal, but also the walls of the cell hairs become yellow or brown. The seeds of infected bolls may be apparently healthy or may be shrunken and discoloured; even in the former case, however, the presence of the fungus can be detected within the embryo.

Inoculation experiments on healthy cotton bolls, cut or attached to plants in the field, with pure cultures of the fungus gave positive results when the inoculum was placed either on the lines of union of the carpels or on a deep-seated puncture.

In glucose agar cultures the hyphae of the new *Nematospora*

are very slender, more so than those of *N. coryli*. There are two kinds of yeast cells, viz., a small, lozenge-shaped type, forming large colonies of many cells, with several buds remaining attached to the mother-cell, and large, globular cells from which the long-elliptical ascus mother-cells develop. The hyaline, elliptical asci, with broadly rounded ends and sometimes a slight depression in the middle, measure 42 to 57 by 7 to 12 μ, and contain eight (occasionally only two or four) uniseptate, long, narrow ascospores, with pointed apices and the lower end extended into a flagelliform appendage, the ascospore without the appendage measuring 33 to 40 by 2 to 2·5 μ, and the appendage 20 to 32 μ in length. The ascospores germinate by means of a globular swelling near the septum, from which yeast cells are generally developed, though at times germ-tubes may be formed which grow into hyphae of limited length bearing yeast cells apically and laterally.

The Indian *Nematospora* differs from *N. gossypii*, cultures of which, together with *N. coryli* [ibid., v, p. 389], were obtained from London. *N. gossypii* in the authors' glucose agar cultures forms terminal or intercalary asci, sometimes occurring in chains, measuring 53 to 94 by 6·3 to 10 μ, and containing eight or fewer ascospores measuring 35 to 60 by 2·2 to 2·75 μ, with an appendage 34 to 54 μ in length. The corresponding dimensions given by Ashby and Nowell are 70 to 100 by 8 to 12 μ for the asci, 24 to 30 by 2 to 2·5 μ for the ascospores, and 50 to 100 μ for the appendage. The naviculate asci of *N. coryli*, measuring 63 to 114 by 6·3 to 10 μ, contain eight or more ascospores measuring 36 to 60 by 2 to 2·7, with an appendage 18 to 46 μ in length. The dimensions given by Peglion are 65 to 70 by 6 to 8 μ for the asci, 38 to 40 by 2 to ·3 μ for the ascospores, and 35 to 40 μ for the appendage. On potato slabs the Indian *Nematospora* forms an encrusted, cauliflower-like, pure white growth consisting of asci, ascospores, and yeast cells, compared with a flat, feathery development in the case of the two foreign species. The Nagpur fungus is considered to be a new species, for which the name *N. nagpuri* is proposed.

Work connected with insect and fungus pests and their control. Progress in chief industries.—*Rept. Agric. Dept., St. Vincent, for the year 1929*, pp. 7–17, 1930.

As no cotton planting was allowed in St. Vincent during the period under review until 1st September (four months later than in previous years), the plants experienced heavy rains while young and liable to damping-off (*Sclerotium rolfsii*) [*R.A.M.*, ix, p. 158]; growers are therefore warned to keep their fields thoroughly weeded, as in well-weeded fields young cotton is seldom or never attacked by the disease. Soft rot of cotton bolls (*Phytophthora* sp.) [loc. cit.] was almost non-existent, although in previous seasons it had destroyed at least 50 per cent. of the mature bolls. After one year's trial planters are almost unanimously agreed that the change in the planting season was well advised; even better results would have been obtained had the 1929–30 crop received the usual cultural attention.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1929.—105 pp., 3 pl., 1930.

This report contains (p. 27) the following item of phytopathological interest. One of the objects of the Central Provinces and Berar Research Scheme is to obtain superior and prolific cotton varieties immune from wilt disease [*R.A.M.*, ix, p. 452]. In this connexion it is mentioned that a strain of *Gossypium verum* has been found resistant to wilt even on land where *G. roseum* and other cottons fail to grow. The lint of this variety is far better for spinning purposes than that of *G. roseum*, and an immense demand for the seed has consequently arisen. During the period under review, some 450,000 lb. were sown, covering an area of 35,000 acres.

West (J.). **Rhizoctonia solani on Cotton in Trinidad, 1929–30.**—*Trop. Agriculture*, vii, 8, p. 223, 1930.

Experimental plots sown with Sea Island and Million Dollar cotton in Trinidad became heavily infected by *Rhizoctonia* [*Corticium*] *solani*, the attack probably being favoured by unsuitable cultural practices and heavy rains immediately after sowing. The infections were of three types, viz., (*a*) those in which the seedlings were killed before the plants emerged from the soil, (*b*) those in which the seedlings were attacked at ground level, and (*c*) those in which plants three to four weeks old were killed.

In a further test made to ascertain the pathogenicity of *R. solani* on 26 [named] different cover crops and maize, all but the latter were attacked.

Forsteneichner (F.). **Beizversuche an Baumwollsamen mit den Trockenbeizmitteln Tillantin R und Ceresan.** [Disinfection experiments on Cotton seeds with the dusts tillantin R and ceresan.]—*Nachricht. über Schädlingsbekämpf.*, v, 3, pp. 136–147, 5 figs., 1930.

Cotton seedlings in the Adana region of Turkey are liable to infection by a species of *Rhizoctonia* [cf. *R.A.M.*, ix, pp. 379, 452] which is chiefly important as a precursor of various facultative parasites, such as *Gibberella moniliformis* [ibid., ix, p. 179], *Fusarium scirpi* (*F. gibbosum*) [ibid., iii, p. 202], *Rhizopus nigricans* [ibid., viii, p. 567], *Alternaria* sp. [ibid., viii, p. 568], and *Aspergillus niger* [ibid., p. 485]. Details are given of a series of laboratory experiments in which excellent control of these organisms was given by dusting the seed with tillantin R and ceresan (1,000 gm. per 100 kg. of seed), the latter being particularly efficacious. The practical application of these results under the prevailing conditions of cotton cultivation in Turkey is briefly discussed.

Redaelli (P.). **Notices sur la biologie du 'Coccidioides immitis' et sur sa position systématique.** [Notes on the biology of *Coccidioides immitis* and its systematic position.]—Reprinted from *Boll. Sez. Ital. Soc. Internaz. Microbiol.*, ii, 7, 5 pp., 1930.

From a study of the relevant literature the author considers it

probable that numerous strains of *Coccidioides immitis* [*R.A.M.*, x, p. 27] exist, differing essentially in their biological characters. The strain generally known as *Blastomycoides immitis* he holds to be the type strain of *C. immitis*, whereas that known as *B. dermatitidis* differs from *C. immitis* in that it sometimes produces a dark pigmentation on mannitol and lactose agar.

In culture on artificial media *C. immitis* produces an apparently sterile mycelium with (in old cultures only) intercalary and terminal chlamydospores. In living animal tissues the chlamydospores become changed into round elements with a double contour, the protoplasm of which gradually forms endogenous spores, while the wall becomes very thick; the endospores are released by rupture of the thick wall and repeat the cycle. Mycelial elements are never found in parasitized tissues, nor do budding or (save exceptionally) germination occur.

Discussing the question whether a real internal formation of spores is found in this cycle, or whether the internal formations in the cysts are only protoplasmic granules and the cysts themselves only chlamydospores, the author states that his cytological study of the life-cycle of *C. immitis* in the tissues of guinea-pigs and rats leads him to adopt the view that there is a true endogenous sporulation; from a cytological point of view the small bodies produced in the cyst are perfectly organized. When mature each is capable of producing mycelium in the pus exuded from the lesions when grown in hanging drop cultures. When the fungus was grown in culture, that part which remained in direct contact with and partly penetrated the substratum showed an abundant formation of the round bodies with the double contour, and a slight indication of inception of the life-cycle, though no complete sporangium with endospores was seen.

As regards the systematic position of *C. immitis* [ibid., vii, p. 167; viii, p. 103], the author considers that it is probably one of the Protomycetaceae. When the chlamydospores formed under saprophytic conditions are inoculated into living tissues they develop into asci which are considered to be analogous to those of *Protomyces*.

Sartory (A.), Sartory (R.), Hufschmitt (G.), Meyer (J.). **Étude d'un Cryptococcus nouveau (Cryptococcus corallinus) isolé de lésions rappelant les kérions trichophytiques.** [Study of a new *Cryptococcus* (*Cryptococcus corallinus*) isolated from lesions recalling trichophytic kerions.]—*Comptes rendus Soc. de Biol.*, civ, 26, pp. 1316–1318, 1930.

From nodular lesions, somewhat resembling trichophytic kerions, on a patient's hair, the writers isolated a species of *Cryptococcus* forming pink colonies on various media (especially with the addition of maltose). Gelatine is liquefied, milk coagulated, and glucose fermented. The optimum temperature for growth is 25° to 28° and the maximum 37° C. The fungus, which is named *C. corallinus* n. sp., is characterized by spherical cells measuring 2 to 4 μ, occurring singly or in groups of 3 to 5.

Da Fonseca (O.). **Affinidades parasitologicas e clinicas entre o tokelau da Asia e da Oceania e o chimbêrê dos indigenas de Matto-Grosso.** [Parasitological and clinical affinities between the 'tokelau' of Asia and Oceania and the 'chimbêrê' of the natives of Matto-Grosso.]—Reprinted from *Rev. Med.-Cir. Brasil*, xxxviii, 8, 31 pp., 4 pl., 1930. [English translation.]

This is a detailed study of the parasitological and clinical affinities between the dermatomycoses known, respectively, as 'tokelau' and 'chimbêrê'. The first-named occurs in the Malayan Peninsula (probably its original centre), the South Sea Islands, Indo-China, Ceylon, and other parts of Asia, while the latter is restricted to isolated groups of Indians living remote from civilization in the Matto-Grosso, Brazil. Taxonomic studies, however, are considered to leave no doubt as to the relationship existing between the causal organisms of these two conditions.

The fungus isolated from the large, circinate, confluent, very scaly, pruriginous, and markedly achromatic lesions of chimbêrê is characterized by profusely branching, septate hyphae without differentiated spores, except for a few chains of oidia or arthrospores of the *Mycoderma* type [*R.A.M.*, ix, p. 243]. Cultures of the organism on Sabouraud's maltose medium formed prominent, cerebriform, glabrous, wet, yellowish to reddish colonies which were composed of a slender, branched, septate mycelium, the sole reproductive organs on which are terminal and intercalary chlamydospores. The occurrence of branched hyphae resembling the so-called 'chandeliers' of favus was sometimes observed. The fungus is classified as a new species of *Endodermophyton* [*roquettei*; transferred by Vuillemin to the genus *Mycoderma*: loc. cit.].

Chimbêrê may be differentiated from 'pinta' or 'caráte' (associated with *Malassezia tropica*, *Cladosporium mansoni*, and *Trichophyton* spp.) [ibid., v, p. 32] by the total absence in the first-named condition of the coloured patches typical of the latter.

A six-page bibliography is appended.

Catanei (A.). **Étude des teignes dans la Grande Kabylie.** [Study of ringworms in the Grand Kabylia.]—*Bull. Soc. Path. Exot.*, xxiii, 2, pp. 170–173, 1930.

Continuing his studies on the incidence of ringworm among the juvenile population of Algeria [*R.A.M.*, ix, p. 653], the writer examined 661 children under 16 years old and two persons under the age of 20 in the mountainous region of the Grand Kabylia. Ringworm was found to be present in 121 of the subjects (18·2 per cent.), 89 of whom were suffering from trichophytosis (*Trichophyton glabrum* and *T. violaceum*) [ibid., ix, pp. 525, 719] and 32 from favus (*Achorion schoenleini* [ibid., x, p. 30]; *T. glabrum* was about three times as prevalent as *T. violaceum*.

Da Fonseca (O.) & Levy (A. S.). **Una epidemia de tonsurante infantil no Rio de Janeiro.** [An epidemic of infantile ringworm in Rio de Janeiro.]—*Rev. Med.-Cir. Brasil*, xxxvii, pp. 136–141, 1930. [Abs. in *Bull. Inst. Pasteur*, xxviii, 21, p. 997, 1930.]

Thirty per cent. of the children in a school in Rio de Janeiro

were attacked by ringworm, a disease to which little attention has been paid in Brazil. Infection was almost exclusively confined to boys, the causal organism being *Trichophyton violaceum* [see preceding abstract]. Only three girls were affected; the parasite in these cases was *T. acuminatum* [*R.A.M.*, ix, p. 653].

FALCHI (G.). **Le dermatomicosi nella provincia di Pavia. Considerazioni botaniche, statistiche e cliniche.** [The dermatomycoses of the province of Pavia. Botanical, statistical, and clinical considerations.]—*Soc. Med. Chir. Pavia*, 65 pp., 3 pl., 1 graph, 1928. [Abs. in *Bull. Inst. Pasteur*, xxviii, 26, pp. 995–996, 1930.]

Eleven species of *Trichophyton* were found to be implicated in the etiology of the 258 cases of dermatomycosis clinically and culturally investigated by the author in the province of Pavia. *T. cerebriforme* [*R.A.M.*, x, p. 30] was responsible for 65 cases, *T. acuminatum* [see preceding abstract] for 32, *T. plicatile* for 26, *T. rosaceum* for 23, *T. radiolatum* for 17, *T. lacticolor* for 15, *T. asteroides* for 14, *T. crateriforme* for 13, *T. album* for 12, *T. violaceum* for 8, and *T. vinosum* for 1. *T. violaceum* is stated to be much less prevalent in Pavia than in other parts of Italy. *T. acuminatum* and *T. cerebriforme* occur on adults as well as children, producing torpid or inflammatory lesions. Microsporosis was found to be rare, only 4 cases due to *Microsporon audouini* and 2 to *M. lanosum* being observed. *Achorion schoenleini* caused all the cases of favus examined.

The writer investigated a case of onychomycosis connected with microsporosis of the beard due to *M. audouini*, the diagnosis being confirmed by cultures from the two lesions. *T. radiolatum* was isolated from a desquamative dermatitis of the hands and an erythemato-bulbous condition of the sole of the foot. *Monilia* [*Candida*] was responsible for plantar and interdigital abrasive dermatitis in two patients [cf. ibid., ix, p. 455]. Comparative statistics are given for different parts of Italy and other regions of the world.

SARTORY (A.), SARTORY (R.), MEYER (M.), & MEYER (J.). **Contribution à l'étude des mycoses osseuses : une mycose osseuse primitive à 'Sporotrichum carougeaui' Langeron.** [Contribution to the study of the osseous mycoses: a primary osseous mycosis due to *Sporotrichum carougeaui* Langeron.]—*Bull. Acad. Méd.*, Sér. 3, civ, pp. 98–101, 1930.

The tibia superior of a woman at Strasbourg suffering from pains in the knee was found to be infected by *Sporotrichum carougeaui* Langeron 1913 [*R.A.M.*, iv, p. 737], this being apparently the first record of the fungus in Europe. The organism grew well on a number of standard media, the optimum temperature for its development being 25° to 28° C. Gelatine is liquefied, milk coagulated, and glucose and other sugars fermented. *S. carougeaui* differs from *S. schenckii* [ibid., viii, p. 634] in the assimilation of saccharose, and from *S. beurmanni* [ibid., ix, pp. 184, 246] and *S. gougeroti* [ibid., iv, p. 737] in that of inulin and mannite.

The septate, branched, white hyphae of *S. carougeaui* measure 2·5 to 3 μ in width and the piriform, hyaline, unicellular conidia 3·5 μ in length (4·5 μ with sterigma). The fungus is pathogenic to insects (flies, spiders, &c.), which may act as agents of infection. Mice and dogs proved susceptible to inoculation.

ASCHIERI (EUGENIA). **Un Sporotrichum nuovo parassita dell'uomo.** [A new species of *Sporotrichum* parasitic on man.]—*Atti Ist. Bot. R. Univ. di Pavia,* Ser. iv, 1, pp. 199–222, 8 figs., 2 graphs, 1929. [Latin summary. Received October, 1930.]

This is a morphological, cultural, and taxonomic account of a species of *Sporotrichum* isolated from a hospital case in Venice suffering from deep-seated lesions (contracted in Brazil) on the feet, which involved abscission of the toe joints. The fungus is characterized by a mycelium of densely interwoven, creeping, irregularly septate hyphae, from 2·5 to 3·5 μ in diameter, on which arise hyaline, monopodially branched, straight or contorted fertile hyphae of varying length. The spores are hyaline, rounded or slightly elongated, 2·3 to 3 μ in diameter, disposed in small groups on short lateral branches or inserted singly either sessile or on short pedicels which sometimes persist on the hyphae. Comparative cultural studies of the organism [details of which are given] showed that it differs from any of the other species of *Sporotrichum* known to be pathogenic to man or animals (a list of which is given, together with a list of species that must be excluded from this genus as belonging to other genera). It agrees most closely in its morphological and cultural characters, as well as in its temperature relations, with *S. epigaeum* Brun., with which it is provisionally considered to be identical, although so far this species has only been recorded as a saprophyte.

BERGEON. **A propos de trois cas d'aspergillose animale.** [Three cases of aspergillosis in animals.]—*Bull. Soc. Méd-Chirurg. Indochine,* vii, 2, pp. 116–121, 1929. [Abs. in *Trop. Veterinary Bull.*, xviii, 3, p. 90, 1930.]

Notes are given on three cases in French Indo-China in which *Aspergillus niger* was isolated from yellow nodular lesions in the lungs and cortex of the right kidney of a heifer, from similar lesions in the lungs, kidneys, and liver of an Annamite bull, and from similar nodules in the thoracic organs of a stag.

LAXA (O.). **Margarinomyces Bubáki—ein Schädling der Margarine.** [*Margarinomyces bubáki,* a pathogen of margarine.]—*Zentralbl. für Bakt.,* Ab. 2, lxxxi, 15–22, pp. 392–396, 3 figs., 1930.

A brief account is given [but without a technical diagnosis] of the morphological and cultural characters of a fungus, *Margarinomyces bubáki* n. g., n. sp., responsible for the production of greenish-black spots on margarine in Czecho-Slovakia. The organism is characterized by dirty brown or green to greenish-black, segmented, undulating or cirrhiform hyphae of irregular width and slightly curved, elongated, unicellular conidia, 5 μ in length, budded off in numbers from the swollen ends of the hyphae. It grows very

slowly and is readily inhibited by contact with ordinary moulds. The fungus was killed by 20 minutes' exposure to a temperature of 70° C. but not of 60°, so that the death point lies within this range.

The development of *M. bubáki* was checked by sodium fluoride, boric acid, and salicylate of sodium (0·05, 0·1, and 0·5 per cent., respectively), but as the use of these preservatives is illegal in Czecho-Slovakia it was necessary to resort to other preventive measures, such as sterilization of the walls, machinery, and the like, in the factory involved. The fungus is believed to have originated in well water, and was found to thrive in the residues of acid whey adhering to the manufacturing apparatus.

M. bubáki has also been found in black spots on the walls of a dairy in Moravia.

TOBLER (F.). **Zur näheren Kenntnis des 'müden' Flachses.** [Contribution to a more exact knowledge of 'sick' Flax.]—*Faserforschung*, viii, 3, pp. 219–220, 1 fig., 1930.

Attention is drawn to an anatomical peculiarity in flax stems from 'sick' soil [*R.A.M.*, ix, p. 783], namely, a conspicuously loose structure of the fibre bundles, the individual fibres composing which are abnormally large, round, and thin-walled. A similar condition has been observed in flax plants suffering from deficiency of potash or excess of nitrogen, and it is suggested that the phenomenon of 'sickness' may be due in some measure to a reduced assimilatory capacity. In South America Boerger has developed a variety of flax known as Malabrigo, which has proved resistant to 'sickness' (*Faserforschung*, vii, p. 177, 1929), while Schilling in Germany is working on the same lines (*Der Deutsche Leinenindustrielle*, xlvii, p. 935, 1929).

HENRY (A. W.). **Inheritance of immunity from Flax rust.**—*Phytopath.*, xx, 9, pp. 707–721, 2 figs., 1930.

In this paper the author discusses and tabulates the results of three years' studies (1923 to 1926) on the inheritance of immunity from flax rust (*Melampsora lini* var. *liniperda*) at St. Paul, Minnesota [*R.A.M.*, vi, p. 358].

Three immune varieties, viz., Argentine selection, Ottawa 770 B, and Bombay were used as parents in these investigations; they were inoculated with several North American collections of the rust and with one European from Groningen, Holland. The two first-named were also tested by Hiratsuka in Japan [ibid., vii, p. 514]. These varieties remained immune in all the trials. When they were crossed with the susceptible varieties, Saginaw, Winona, Blue Blossom Dutch, and Chippewa, immunity from rust proved completely dominant in all the crosses, the F_1 plants invariably remaining immune. In the Argentine selection × Saginaw cross evidence was obtained indicating that immunity from rust depends on two duplicate factors, whereas in crosses where Ottawa 770 B and Bombay were used as immune parents there was only a single factor difference between immunity and susceptibility. Immunity from rust was apparently inherited independently of flower and seed colour in crosses of Ottawa B on Winona and Saginaw.

Many of the numerous selections made from the F_3 and F_4 families of the various crosses gave promise of value in fibre and seed production. Immunity from rust was combined in these selections with various characters lacking in the immune parents, e.g., greater height and earliness, fewer branches, and variations in the colour and size of flowers and seeds. Arrangements are in progress for testing these selections for resistance to wilt [*Fusarium lini*: ibid., viii, p. 787].

NANNFELDT (J. A.). **En skadesvamp å Mahonia, Uropyxis mirabilissima, stadd i stark spridning.** [A parasitic fungus on *Mahonia*, *Uropyxis mirabilissima*, in process of active dissemination.]—*Botaniska Notiser, 1930,* 5, pp. 371–379, 1930. [English summary.]

Notes are given on the distribution of the *Mahonia* (*Berberis aquifolium*) rust (*Puccinia mirabilissima*) [*R.A.M.*, x, p. 33] in Scotland, Germany, and the Scandinavian countries (including Finland). In Sweden the fungus has been found at Malmö, Upsala, Västeråo, and Linköping, having probably been introduced into the last-named place on bushes imported from Germany during 1917–18. Since the rust was detected in the latter country (at Rostock) on 15- to 17-year-old bushes in 1928, it was probably present before the outbreak of the war [cf. next abstract]. In any case north Germany and Denmark appear to be the centres of *P. mirabilissima*, the spread of which into the neighbouring countries is thus readily explicable.

HAMMARLUND (C.). **Rostsvampar på Mahonia (Puccinia mirabilissima Peck och P. graminis Pers.).** [Rust fungi on *Mahonia* (*Puccinia mirabilissima* Peck and *P. graminis* Pers.).]—*Botaniska Notiser, 1930,* 5, pp. 380–407, 3 figs., 1 map, 1930. [English summary.]

Puccinia mirabilissima is stated to have spread very rapidly on *Mahonia* [*Berberis*] *aquifolium* in Sweden since 1928, being now reported from over 100 localities [see preceding abstract]. Only in one case was the rust found to be disseminated by the transplanting of infected individuals, infection occurring in every other instance on 10- to 20-year-old plants. In 33 of the above-mentioned localities infection evidently took place during 1929–30, the writer having previously searched for the fungus without success. The heavy snowstorms occurring early in 1929 are believed to have favoured the rapid dissemination of *P. mirabilissima*, which is capable of withstanding very low temperatures. Uredospores exposed to $-10°$ to $-20°$ C. for a month retained their viability, and the minimum temperature for the development of the rust is only a few degrees above 0°, with an optimum and maximum at 8° to 12° and 20°, respectively.

In addition to uredo- and teleutosori, numerous aecidia were observed in the spring of 1930. Inoculation experiments with aecidiospores on the leaves of *B. aquifolium* resulted in the development of uredosori at many of the points of infection, thereby demonstrating the genetic connexion between the different stages of the rust.

A comparative microscopical examination of the aecidia of *P. mirabilissima* from *B. aquifolium* and *P. graminis* from *B. vulgaris* revealed significant differences [which are indicated] in the shape of the aecidia and pseudoperidial cells, and in the form and dimensions of the aecidiospores. The last-named measure, in *P. mirabilissima*, 16·5 to 22·5 by 16·5 to 24·3 μ (average 18·6 by 20·3 μ), and in *P. graminis*, 15 to 21 by 16·5 to 22·4 μ (average 16·2 by 20 μ). In the former the spores are mostly angular, with the lower wall much thickened, while in the latter they are globular or slightly angular with walls of uniform thickness.

SACKETT (W. G.). **Report of Bacteriologist.**—*Forty-second Ann. Rept. Colorado Agric. Exper. Stat. for the year 1929*, pp. 20–24, 1929. [Received June. 1930.]

This report contains the following item of phytopathological interest. The general decline in productivity of the Colorado lucerne crop observed during the past five years is attributed in part to winter injury and partly to the ensuing attacks of bacterial wilt [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 13]. Varietal tests have given some evidence that Grimm and Canadian Variegated are more resistant to the disease than Cossack, Hardigan, Ladak, Turkestan, and Utah Common, but further observations on this point are desirable.

DEARNESS (J. B.) & SANFORD (G. B.). **A new species of Plenodomus.**—*Ann. Myc.*, xxviii, 3–4, pp. 325–326, 1930.

Plenodomus meliloti Dearness & Sanford n. sp. (a diagnosis of which in English and Latin is given) has been found to cause necrotic brown lesions on the roots of *Melilotus*, *Medicago*, and *Trifolium* spp. in Alberta and Saskatchewan, Canada. The fungus, which is allied to *P. destruens* Harter, the causal organism of a foot rot of sweet potato (*Journ. Agric. Res.*, i, p. 251, 1913), is characterized by black, hemispherical to subglobose pycnidia, 0·25 to 2 mm. in longest diameter by 0·3 to 1·25 mm. in depth; short, hyaline conidiophores; and hyaline, broadly elliptical, biguttulate spores measuring 4·2 to 6·3 by 2·1 to 3·5 μ (average 5·25 by 2·87 μ). The minimum temperature for growth on potato dextrose was found to be 0° C., with an optimum at 15°.

ESMARCH (F.). **Eine Stengelerkrankung des Klees durch Sclerotinia sclerotiorum (Lib.) Sacc. et Trott.** [A stem disease of Clover due to *Sclerotinia sclerotiorum* (Lib.) Sacc. et Trott.]—*Die Kranke Pflanze*, vii, 9, pp. 127–128, 1930.

A brief, popular note is given on the recent detection, in various parts of Saxony, of clover plants showing the typical symptoms of stem rot caused by *Sclerotinia sclerotiorum* [*R.A.M.*, vi, p. 630]. This appears to be the first record of the fungus in question on clover in Germany, indicating that special conditions are essential to its development.

ELMER (O. H.). **Some diseases of nursery stock.**—*Bienn. Rept. Kansas State Hort. Soc.*, xl, (*1928–1929*), pp. 167–174, 1930.

Some general observations are made in popular terms on

a number of important fungous, bacterial, and physiological diseases of nursery stock, including apple, peach, plum, and cherry trees, raspberries and blackberries, strawberries, conifer seedlings, and various ornamental plants.

MANEY (T. J.). **Crown gall and Apple propagation.**—*Bienn. Rept. Kansas State Hort. Soc.*, xl (*1928–1929*), pp. 155–161, 4 figs., 1930.

Popular notes are given on the occurrence and control of crown gall of apples in the United States. It is stated to be now definitely established that only 20 per cent. of all so-called crown gall is caused by *Bacterium tumefaciens* [*R.A.M.*, ix, pp. 596, 655]. Directions are given for improved methods of grafting by means of a modified tongue or whip in conjunction with the use of an adhesive tape wrap.

ROSEN (H. R.). **Overwintering of the fireblight pathogen, Bacillus amylovorus, within the beehive.**—*Science*, N.S., lxxii, 1864, pp. 301–302, 1930.

There is some evidence that apart from the overwintering of fireblight bacteria (*Bacillus amylovorus*) within the twigs and limbs of apple trees infected during the previous year [*R.A.M.*, ix, p. 189], the bacterial masses liberated as exudate during the preceding growing season and surviving the winter, or bacteria freed by the disintegration of formerly diseased leaves, shoots, flowers, and fruit, may remain viable. Certain strains of bacteria of proved pathogenicity, though differing markedly from the normal type of *B. amylovorus* in morphological and physiological features, have been isolated in Arkansas in the early spring from such material.

A second potential source of overwintered inoculum is the living quarters of certain insects that have been in contact with diseased material. The writer reports the successful isolation of the fireblight organism from beehive material collected throughout the summer, winter, and early spring, and also from bees obtained from the hives in the early spring before the development of the disease. This discovery may afford an explanation of the common occurrence of blossom blight in the absence of twig infection and consequent early spring exudate; and further, of the failure of systematic control measures in the orchard. Since bees are essential for pollination wherever self-sterile apples and pears are grown, it is impossible to dispense with them, but in future the maintenance of uninfested hives must constitute one of the problems of fireblight control.

CARDINELL (H. A.). **Ringing fruit trees sometimes spreads blight.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, xiii, 1, pp. 12–15, 2 figs., 1930.

In 1927 the Huron Farms Company began a three-year programme of ringing Baldwin and Northern Spy apple trees with a view to induce the fruiting of trees that had failed to blossom by their tenth or eleventh season in the orchard. Each year two rings were cut $\frac{1}{8}$ in. apart round each limb without removing the bark, on one-third of the limbs of each tree. During the first two

seasons no fireblight [*Bacillus amylovorus*] developed, but in 1929, when the disease was rampant, of 437 ringed Baldwin trees 146 became infected at the cuts, though only one Northern Spy tree, out of 176 ringed, showed any blight. Many of the rows of the two varieties alternated, and the operator, working on each tree along the rows, spread the disease on the Baldwins only.

If the top of a tree is blighted ringing is likely to provide a path for infection in the limbs. To prevent infection being spread by the knife, the blade should be sterilized before each cut with Day's mercury-glycerine disinfectant [one-eighth ounce each crystals of mercuric cyanide and mercuric chloride dissolved in three pints commercial glycerine and one pint distilled or rain water: cf. *R.A.M.*, vi, p. 103].

PILÁT (A.). **Choroš Coriolus hirsutus (Wulf.) Quél. jako parasit ovocných stromů.** [The polypore *Coriolus hirsutus* (Wulf.) Quél. as a parasite on fruit trees.]—*Ochrana Rostlin*, x, 3, pp. 57–65, 5 figs., 1930.

A brief account is given of a serious trunk rot of cherry trees which was observed in 1930 by the author in the vicinity of Plzen [Pilsen, Bohemia], and the causal organism of which was identified as *Coriolus* [*Polystictus*] *hirsutus* [cf. *R.A.M.*, v, p. 305]. All the indications were that the fungus had first established itself saprophytically in mechanical injuries, mainly frost cracks in the trunks, whence it spread both radially and tangentially into the living tissues (including the cambium), which were killed in advance presumably by the excretion of toxic substances by the fungus. The heartwood was comparatively little attacked, but the sapwood was reduced to a soft, almost cheesy condition when wet, and became very brittle and friable when dry. After penetrating to a certain depth in the wood, the mycelium tended to grow towards the surface, killing new areas of the cambium above it in the process. The progress of the rot appeared to be fairly rapid; the crown of the affected trees at first died off only on the side above the lesions, but they were finally killed. Only adult trees were attacked, at the time when they were most productive. The fruiting bodies of the fungus formed at a certain height up the trunk were quite rudimentary and devoid of hymenium; those formed lower down, and especially close to the soil, were better developed and differentiated a hymenium, but remained sterile and differed considerably in shape and colour from the type species, in many respects resembling old hymenophores of *C.* [*P.*] *versicolor*.

In the same locality and in the neighbourhood of Prague the fungus was also found attacking other fruit trees, chiefly apples, on which the damage done by it was as serious as that on cherry trees. On the apple the fruiting bodies attained larger dimensions than on the cherry, and approached closer to the characters of the type species. The hymenium was entirely normal, and produced hyaline, cylindrical, frequently somewhat bent spores, 5 to 7 by 1·5 to 2·5 μ in diameter, borne on hyaline, clavate basidia measuring 12 to 15 by 4 to 5 μ.

For the control of the fungus it is recommended that all dead trees and stumps bearing the sporophores should be removed from

the orchards. Great care should be exercised not to leave in the orchards any kind of débris from the removed trees, as it is thought probable that sawdust, wood chips, and fragments of bark infected with mycelium may easily be blown about, and thus spread the disease to healthy trees. In cherry orchards the removal of the badly diseased trees is also recommended.

SMITH (E. C.). **Trametes hispida a destructive parasite in Apple orchards.**—*Mycologia*, xxii, 5, pp. 221–222, 1 pl., 1930.

The author's observations lead him to doubt the purely saprophytic nature usually attributed to *Trametes hispida* [*R.A.M.*, ii, p. 300; iv, p. 576] (the American form of which is generally called *T. peckii*). Well-developed pilei of this fungus were found in Colorado on an apricot tree, the heartwood of which was decayed by a complex rot. Later it was again found in the same State on a living and otherwise healthy cottonwood [*Populus*] tree, on which the development of the sporophore was followed to maturity. Numerous brackets of the fungus were also found about a mile south of Fort Collins on apple trees. Investigations extending over three years showed that these brackets represented the final stage of disease, and that the initial infections, easily overlooked, occurred on the living twigs and young branches of the apple trees. As the twigs and branches were pruned off, the mycelium progressed to the base of the branch and finally to the trunk, in which a typical heart rot was produced. Some forty trees in the orchard in question had been killed, many were distinctly weakened, and a considerable number showed initial infections. All the indications were that in this orchard the fungus was behaving primarily as a parasite. A similar condition is stated to have been also observed in apple orchards in the vicinity of Cañon City.

OSTERWALDER (A.). **Von einer bisher unbekannten Fleckenkrankheit an unreifen Äpfeln.** [On a hitherto unknown spot disease of unripe Apples.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 20, pp. 406–409, 3 figs., 1930.

Attention is drawn to the occurrence, in St. Gall and other parts of Switzerland, of a black spotting of unripe apples caused by a fungus determined as a new species of *Stemphylium*, which is named *S. maculans* [without a diagnosis]. The spots are smooth, glistening, with fimbriate edges, and measure 0·5 to 1·5 mm. in width. The fungus is a weak parasite, gradually penetrating the epidermis without rupturing it as in scab [*Venturia inaequalis*]. The symptoms of the new disease are briefly compared with those of ordinary scab, and with the atypical form of *V. inaequalis* and 'dust speck' recently described by Laubert [*R.A.M.*, x, p. 38]. Among the varieties affected are Champagne and Canada Reinette, Taffet, Winter Stettin, Aargauer Jubiläum, Jacques Lebel, and Brünnerling.

FISCHER (R.). **Über Spätschorfbefall der Äpfel.** [On late scab infection of Apples.]—*Bundesanst. für Pflanzenschutz, Mitt.* 198, 2 pp., 4 figs., 1929. [Received November, 1930.]

Attention is drawn to the frequent occurrence in Austria during recent years of late infection of apples by scab (*Venturia*

inaequalis), which takes the form of minute, brownish-black spots, ultimately extending to nearly 1 cm. in diameter and penetrating the flesh. Wound cork formation ceases after the fruit has ripened, so that the parasite meets with no resistance. Considerable damage has been caused by this form of scab in storage [see preceding abstract]. The disease is most prevalent in mountainous regions with a temperate climate, and often occurs on varieties which have remained free from attack throughout the season. In order to prevent the further development of the fungus, the apples should be stored in cool, well-ventilated, fairly dry rooms. The ordinary spraying schedule should be supplemented, where the disease is likely to occur, by one or two late applications of 1 per cent. Bordeaux mixture.

BROOKS (C.), COOLEY (J. S.), & FISHER (D. F.). **Diseases of Apples in storage.**—*U.S. Dept. of Agric. Farmers' Bull.* 1160, 19 pp., 23 figs., 3 graphs, 1930.

Popular notes are given on the following diseases occurring on stored apples in the United States. The form of scab (*Venturia inaequalis*) developing in storage is characterized by smooth, black, sunken spots quite distinct from those found at picking time [see preceding abstract]. Stigmonose is the term applied to spots and other malformations resulting from insect punctures. In some of these there is a marked depression on the surface, a considerable layer of hard tissue beneath, and a definite puncture mark, but more often the only sign of injury is a brown, corky spot or collection of spots just below the skin, bearing a close resemblance to bitter pit. Water-core [see next abstracts] is stated to be most prevalent in regions of intense heat and sunlight on the Tompkins King, Fall Pippin, Yellow Transparent, Early Harvest, Rambo, and Winesap varieties. Bull's eye rot is the common name for the fruit rot caused by both anthracnose (*Neofabraea malicorticis*) and perennial canker (*Gloeosporium perennans*) [*R.A.M.*, ix, p. 433]. Spongy dry rot (*Volutella fructi*) is reported to cause considerable loss in North Carolina, New York, and other Atlantic Coast regions. The spots resemble those of black rot (*Sphaeropsis malorum*) [*Physalospora cydoniae*] but are more sunken, while the texture of the tissue is firmer and drier and the colour more uniformly black throughout.

The other apple fruit diseases described in this paper are fruit spot (*Mycosphaerella pomi*) [ibid., ix, p. 289; x, p. 36], Jonathan spot, bitter pit, drought spot, bitter rot (*Glomerella cingulata*), *Alternaria* rot (*A.* spp.), blue mould (*Penicillium expansum*), pink rot (*Cephalothecium* [*Trichothecium*] *roseum*), brown rot *Sclerotinia cinerea* [*S. americana*], grey mould (*Botrytis* sp.), internal breakdown, soft scald, and internal browning [ibid., x, p. 39].

Appropriate measures for the prevention of these diseases are indicated.

CARNE (W. M.), PITTMAN (H. A.), & ELLIOTT (H. G.). **Notes on wastage of non-parasitic origin in stored Apples.**—*Journ. Australian Council Sci. & Indus. Res.*, iii, 3, pp. 167–182, 1 pl., 1930.

In this paper, which is in continuation of their study of the

bitter pit problem in Australia [*R.A.M.*, ix, p. 321], the authors summarize the results of their recent investigations into the nature, causes, and control of wastage of non-parasitic origin in stored apples [cf. ibid., ix, p. 789], with particular reference to those forms of wastage that occur in apples shipped from Australia. The troubles dealt with are classified by the principal factors involved in their causation, namely, over-maturity breakdown caused by normal senility of the fruit; immaturity breakdown and bitter pit breakdown, both due to immaturity at picking time; low temperature breakdown, deep scald, and freezing breakdown, caused by temperatures below 37° F.; water-core breakdown, following water-core; gas breakdown (brown heart) caused by abnormal storage atmospheres; and bruise breakdown caused by mechanical injury to the fruit tissues.

Over-maturity breakdown, a trouble to which early and early mid-season apple varieties are particularly susceptible, is not, so far, one of the more important causes of wastage in Western Australian apples. It may be controlled by preventing the apples from becoming over-ripe either on the tree or in the packing sheds. Well-matured fruits should be cold-stored promptly, and should be loaded into pre-cooled holds. Immaturity breakdown, the temperature relations of which have not yet been definitely ascertained, differs from low temperature breakdown mainly in that, while the incidence of the former decreases with the maturity of the fruit when stored, the incidence of the latter increases. In the author's experiments immaturity breakdown was found in Dunn's apples, commencing as a core-browning and finally developing as a general breakdown associated with superficial scald.

Bitter pit breakdown, which is primarily due to the immaturity of the fruit when picked, differs from immaturity breakdown in that it starts in the cortex, usually close to bitter pit lesions; it has been frequently noted in Australian apples reaching Europe, particularly in Cox's Orange Pippin, Ribston Pippin, and Cleopatra. This breakdown occurs more in cold-stored than in shed-stored fruit, and usually develops after the fruit is removed from storage.

Low temperature (soggy) breakdown has not so far been recorded in Western Australia, and there is no definite evidence of its occurrence elsewhere on the Australian mainland; it does, however, probably occur in Tasmania, but is not considered to be of economic importance either locally or in exported fruit. The same is also true of deep scald (usually termed soft scald), and of freezing injury.

Water-core breakdown following water-core [ibid., v, p. 433] in the fruits is of two types: the first is developed in immature fruit and involves more or less of the core, while the second develops in maturing fruit and does not involve the tissues within the core line of vascular bundles. The first type is generally more severe but less common than the second type, and tends to disappear as the fruit ripens, unlike the second which increases in percentage. though the amount in each apple decreases with the increasing maturity of the fruit at the time of its incidence. The immaturity type often shows as waterlogged patches which are frequently beaded, especially in the early morning, with drops of sugary sap,

while it is rare to get any definite surface indication of the presence of the maturity type. Water-core slowly disappears in storage, the amount remaining apparently depending on the original amount and the length of storage at low temperatures (the higher the temperature, the more rapidly it disappears). With its disappearance, the fruit may return to a normal condition or may break down either in store or when removed. While the factors involved in this process are unknown so far, it is probable that humidity of the store may play a part in it.

A brief reference is made to the investigations in England of the breakdown caused by abnormal atmospheres in storage [ibid., ix, p. 533], and finally it is stated that injury and death of the apple tissues following bruising appear to predispose the fruit to breakdown, as noted in Jonathans, but usually bruised apples succumb to fungal rots before physiological breakdown sets in.

MARSHAL (R. E.). **Storage improves water core Apples.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, xiii, 1, pp. 22–25, 2 figs., 1930.

On 23rd October, 1929, a number of Delicious and Wagener apples, of which 90 per cent. of the former and 50 to 75 per cent. of the latter showed considerable water-core [see preceding abstracts], were placed in storage at 32° F.; on 15th January following none of 50 Delicious apples showed any trace of the condition, and only 3 out of 33 Wageners were still affected.

One bushel of Delicious apples from each of three orchards was placed in cold storage on 29th October, 1929, when all the apples showed water-core, some of them badly. On 15th January, 1930, 40 apples were removed from each bushel, and all were found to be in good condition, the amount of water-core having become reduced during storage from 90 to 12 per cent. The remainder were kept stored until 1st March, when no further water-core was seen.

ELMER (O. H.). **Leaf diseases of Cherry.**—*Bienn. Rept. Kansas State Hort. Soc.*, xl (*1928-1929*), pp. 109–113, 1930.

Notes are given in popular terms on the pathogenicity, life-history, and control of leaf spot of cherries [*Coccomyces hiemalis*: *R.A.M.*, ix, p. 797; x, p. 39] which is stated to have caused widespread damage in Kansas during 1927 and 1928. Attention is drawn to the stunting of the fruits frequently caused by the application of Bordeaux mixture, the replacement of which by lime-sulphur 1 in 40 is recommended.

ANDERSON (H. W.). **Control of Bramble diseases.**—*Bienn. Rept. Kansas State Hort. Soc.*, xl (*1928–1929*), pp. 162–167, 2 figs., 1930.

Directions are given in popular terms for the control of the following diseases of raspberries, blackberries, and dewberries [*Rubus* sp.]: crown gall [*Bacterium tumefaciens*: *R.A.M.*, ix, p. 395], anthracnose [*Plectodiscella veneta*: ibid., ix, p. 580], orange rust [*Gymnoconia interstitialis*: ibid., iii, pp. 280, 300], *Septoria*

leaf spot [*S. rubi*: ibid., v, p. 655], cane blight [*Leptosphaeria coniothyrium*: ibid., ix, p. 535], and the virus diseases, mosaic, leaf curl, and streak [ibid., viii, p. 731].

HUTSON (J. C. & PARK (M.). **Investigation of the bunchy top disease of Plantains in Ceylon.**—*Trop. Agriculturist*, lxxv, 3, pp. 127–140, 3 pl., 1930.

This is a full account of experiments [a brief reference to which has already been noticed: *R.A.M.*, ix, p. 626] which were made in Ceylon in 1928, and the results of which conclusively established that bunchy top of plantains in that island is similar to that in Australia, and is transmitted by the aphid *Pentalonia nigronervosa*. Under the conditions of the tests root injury by eelworms or fungi was found not to be necessarily a factor in the causation of the disease.

The investigation, in which two local varieties of plantains, namely, Hondarawalla (reputed to be relatively resistant) and Kolikuttu (very susceptible), were used, also indicated that apparent differences in susceptibility are probably associated with variations in the incubation period of the disease in different varieties, since in the experiments both varieties gave 100 per cent. infection in the final result.

In discussing methods of control, the authors state that, in their opinion, the disease can be best checked under Ceylon conditions by a periodical examination of the plantations and the complete eradication of all stools that show the early symptoms of the disease, Magee's description of which is reproduced.

REICHERT (I.) & HELLINGER (ESTHER). **A Sclerotinia disease new to Banana fruits, and its relation to Citrus.**—Reprinted from *Hadar*, iii, 9, 14 pp., 6 figs., 1930.

A new rot of bananas, caused by *Sclerotinia sclerotiorum*, occurred in a very severe form in the Jaffa and Jericho districts of Palestine during the winter of 1929–30. Special importance is attached to this disease in the localities in question on account of the pathogenicity of the causal organism to citrus [*R.A.M.*, iv, p. 539; ix, p. 302].

Infection usually begins at the distal end of the fruit and extends towards the stem end. The diseased parts are at first brownish and water soaked in appearance, later dark brown. The mycelium of the fungus is seldom visible, but sometimes an incipient sclerotial structure may be seen, formed from a whitish, later blackish, compact mass of hyphae. The inner tissues show a reddish discoloration which is most conspicuous along the innermost part of the carpellary wall, especially the placenta in the middle. At a more advanced stage of decay the inner tissues turn reddish-black, then black, and finally break down and become hollowed. Sclerotia are produced within as well as on the surface of the fruit.

In badly rotted fruit the mycelium occurs in the starchy pulp at the centre, in the parenchyma of the peel, and (to a slight extent) round the inner vascular bundles, while the outer cortex is free from the fungus. The reddish discoloration was observed to occur

in advance of actual invasion by the parasite, indicating that the latter exerts a toxic action on the cells before entering them.

So far only the sclerotial stage of *S. sclerotiorum* [the life-history of which is briefly described] has been observed on diseased bananas in the orchard, but the fertile fruiting stage is considered likely to occur in the soil. Probably the sterile flowers hanging beneath the fruits may also harbour the fungus. Inoculation experiments [details of which are given] with fragments of mycelium from agar cultures in February, 1930, gave positive results on wounded and unwounded bananas. Repetition of the experiments on 7th and 19th August at a temperature of 28° to 30° C. gave negative results, showing the inability of the fungus to develop at a relatively high temperature and low humidity, and explaining its disappearance from the groves towards the end of April. Inoculation tests on wounded and unwounded oranges with *S. sclerotiorum* from a diseased banana also gave positive results, the fruits being thoroughly rotted within a few days and covered with a whitish, flocculent mycelium giving rise to large sclerotial masses. The disease occurred in a severe form on bunches of bananas tightly enclosed in sacks, and left for a considerable time before cutting and marketing, infection spreading rapidly from one fruit to another by contact.

S. sclerotiorum has been found in Palestine attacking eggplants, lettuce, cabbage, and citrus twigs. Control measures should include free access of air to the fruit, periodical inspections of the groves, and spraying with ammoniacal copper carbonate (150 gm. copper carbonate, 1·5 l. ammonia, and 200 l. water) or ammonical Burgundy mixture (2 kg. copper sulphate, 2·5 kg. sodium carbonate, 1·5 l. ammonia, and 200 l. water).

The potentially formidable character of the *Sclerotinia* disease, especially in relation to the important citrus industry of Palestine, is fully discussed.

LEWIS (D. E.). **The stationary spray plant.**—*Bienn. Rept. Kansas State Hort. Soc.*, xl (*1928–1929*), pp. 53–61, 1930.

Full details are given of the construction, installation, and operation of a stationary spray plant in an orchard at Louisiana, Missouri, stated to be the first of its kind in the Middle West [cf. *R.A.M.*, x, p. 45]. The results of two seasons' work with the plant have been so successful that the adoption of a similar system may be confidently recommended to other growers. At least 40 per cent. of the labour costs incidental to the old method of spraying with portable machines has been saved by the new system.

NEWTON (W.), JOHNSTON (F. B.), & YARWOOD (C.). **Factors influencing the character of Bordeaux mixture.**—*Proc. Canadian Phytopath. Soc., 1929*, pp. 21–26, 1 pl., 1930.

The results [which are tabulated and discussed] of investigations on the relative efficacy of various methods of preparing Bordeaux mixture, indicated that the best conditions for this process are (1) when the reacting solutions are as cold as possible; (2) when the copper sulphate solution is poured slowly into the lime suspension rather than conversely; and (3) when the copper sulphate

is as dilute and the lime suspension as concentrated as practicable. The ideal spray is probably one in which the solids are in a state of maximum dispersion, a condition which was shown to be resultant on a slow reaction between the copper sulphate and the lime. The times taken to settle by sprays prepared by the two best methods, viz., (1) cold $CuSO_4{\cdot}5\,H_2O$ (5 : 150) added slowly to cold CaO (1·5 : 150), and (2) cold $CuSO_4{\cdot}5\,H_2O$ (5 : 250) added slowly to cold CaO (1·5 : 50), were 146 and 130 minutes, respectively.

Alkaline Bordeaux mixture was not found to adhere to leaf surfaces any better than the neutral—rather the reverse—but the physical character of the former was somewhat superior. An injurious effect on the state of the mixture was produced by the addition of sodium silicate, fresh skim milk, and various alcohols as spreaders. The use of wheat flour and agar for this purpose exerted no significant action on the efficacy of the mixture, which was somewhat improved, however, by the admixture of calcium caseinate (0·15 to 0·5 per cent.) both as regards the spread of the wet, and the permanence of the dry film when sprayed on leaf and glass surfaces. Similar good effects were obtained with 0·5 per cent. gelatine, added to the mixed spray. The development of an undesirable curd was induced by the addition of whale oil soap and ordinary washing soaps, with the exception of the 'Crystal White' band, which proved somewhat beneficial. Very satisfactory results were obtained with 'potassium-resin-soap' (0·15 per cent.), prepared by boiling together 2 parts resin, 1 part potassium hydroxide, and 3 parts water by weight: the degree of dispersion of the solids in the spray and the spread and permanence of the film formed on leaf (hops) and glass surfaces were alike improved. 'Sodium-resin-soap' failed to produce a corresponding good effect.

GODBOUT (F. L.). **Some studies of seed treatment.**—*Proc. Canadian Phytopath. Soc., 1929*, pp. 47–54, 2 pl., 1930.

A number of substances were tested at Macdonald College, Quebec, during 1928–9 for their efficacy in the disinfection of various cereal and vegetable seeds. Ceresan was found to be very effective in the control of smuts [*Ustilago avenae* and *U. kolleri*] in the common and hull-less oats in greenhouse and field tests. It also proved useful in the protection of the seed from soil-borne organisms. Under the conditions of the experiments, ceresan was slightly toxic to wheat and common oats, but not to barley and hull-less oats. None of three kinds of iodine dust treatments [see above, p. 90] gave as good control of covered smut in hull-less oats as the other disinfectants used. The smuts of oats were well controlled by semesan, uspulun, and nickel sulphide dusts, the last-named giving specially favourable results.

The treatment of muskmelon, cucumber, spinach, radish, cabbage, and Brussels sprouts seeds with Bayer dip dust, semesan, or nickel sulphide resulted in increased stands. The seedlings of the three first-named crops proved very susceptible to damping-off caused by *Pythium de Baryanum*. Both the organic mercury compounds, semesan and dip dust, gave satisfactory control of damping-off in all the above-mentioned crops except spinach, and even in this

case there was a marked reduction of infection as a result of treatment. Tomato and celery seed were found to be very susceptible to injury from disinfectants.

In a test of the influence of smut infection on the growth of Liberty oats, the infected plants were found to be shorter and their dry weight was decreased, as compared with the controls, during the first three weeks of their growth.

GUILLIERMOND (A.). **Sur la toxicité des colorants vitaux.** [On the toxicity of vital stains.]—*Comptes rendus Soc. de Biol.*, civ, 19, pp. 468–472, 1930.

The results of the investigation briefly summarized in this paper showed that vital stains [i. e., stains used for the differential staining of fungi *in vivo*] exert a toxic effect on the fungi tested at doses varying for each stain, for each species of fungus, and also for each culture medium. The tests included a species of *Saprolegnia*, various yeasts, *Oidium* [*Oospora*] *lactis*, *Spermophthora gossypii*, *Penicillium glaucum*, and species of Mucoraceae, all of which responded more or less similarly to the stains, with the exception of the *Saprolegnia* which was much more sensitive to the action of the stains than the other organisms; this organism further differed from the others in that it accumulated neutral red in its vacuolar system, a fact which renders it an interesting object for cytological studies.

JOHNSON (J.). **Steam sterilization of soil for Tobacco and other crops.**—*U.S. Dept. of Agric. Farmers' Bull.* 1629, 13 pp., 7 figs., 1930.

This bulletin, written in popular language, briefly discusses the beneficial and injurious effects of steam sterilization on the soil, and ennumerates the soil-borne diseases, insect pests, and weeds that are controlled by this method. The installation and working of the inverted pan soil-steaming system is described in detail, with particular reference to tobacco seed-bed cultivation. Recommendations are made in regard to the preparation of the soil for steaming and to its management after the treatment. Under average conditions fully 30 minutes' steaming are required to secure the best results and with the less favourable types and conditions of soil, the treatment may have to be continued for 35 to 40 minutes. It is pointed out, however, that soil, especially in greenhouses, may be unnecessarily injured by heating for an excessive length of time. The cost of the process may vary from $1 to $2 per hundred square feet of seed-bed area.

A brief description is also given of box soil-sterilizers for steaming soil in trays, the larger of which holds as much as a ton of soil at a time. This type is suitable for greenhouses where seedlings are raised in pots or trays.

ELLIOTT (CHARLOTTE). **Manual of bacterial plant pathogens.**—vii + 349 pp., London, Baillière, Tindall & Cox, 1930.

This book will be welcome to plant pathologists as the first adequately complete record in the English language of the bacteria causing disease in plants. The pathogens are described in alpha-

betical order under the genera *Bacillus*, *Bacterium*, and *Aplanobacter* as defined by the late Erwin F. Smith. A condensed account of the morphological and cultural characters, synonymy, symptoms of disease, hosts, geographical distribution, methods of control, and a full reference to the literature in chronological order are given for each species. An additional section records more briefly the non-pathogenic bacteria which have been described as associated with a number of diseases. In a final section the characters of the pathogens are tabulated in a 'chronological chart'. A combined index of hosts and bacteria is provided.

The organism causing the gumming diseases of sugar-cane is recorded for etymological reasons, in agreement with O. Kirchner (*Zeitschr. f. Pflanzenkr.*, xxxiv, p. 260, 1924), as *Bact. vasculorum*.

FITZPATRICK (H. M.). **The lower fungi. Phycomycetes.**—331 pp., 107 figs., New York & London, McGraw-Hill Book Company, Inc., 1930.

The writer's aim in the present work is to provide an adequate treatment of the taxonomy and morphology of the Phycomycetes, which at the same time shall serve as a text- or reference-book for college and university students. It is pointed out that this group is particularly well suited to cytological, biological, cultural, and taxonomic studies, and also for comparative morphological treatment by reason of the diversity of form of its members. The subject-matter of the book consists largely of a compilation from the literature on which the author has based the syllabus of his teaching on the classification of the fungi for some years past. The following orders are described in more or less detail according to their scientific interest or economic importance: Chytridiales, Ancylistales, Blastocladiales, Monoblepharidales, Saprolegniales, Peronosporales, Mucorales, and Entomophthorales, while the concluding chapter deals with the Phycomycetous affinities of the Hemiascomycetes. Keys are provided for all the genera. Each chapter is supplied with a separate bibliography of the more important literature, and the illustrations are well selected and relatively numerous. The work comprises the fullest account of this group which has yet been attempted in English and is probably the most up-to-date in any language.

BAUDYŠ (E.). **Hospodářská Fytopathologie. Díl 1. Přednášky o chorobách hospodářských rostlin.** [Agricultural phytopathology. Part 1. Lectures on diseases of agricultural plants.]—327 pp., 163 figs., Brno, Rolnická Tiskárna [Agricultural Press], 1929. [Received November, 1930.]

This is a compilation of the lectures on agricultural phytopathology, with particular reference to the diseases of agricultural crops and trees in Czecho-Slovakia, given by the author at the College of Agriculture in Brno [Brünn]. The work is divided into three main sections, of which the first deals with diseases of non-parasitic origin, the second with enzymatic and virus diseases, and the third with bacterial and fungal parasites which are arranged in the systematic order of the organisms. Control measures are discussed *pari passu* with the accounts of the

diseases. Many of the illustrations are original, and the bibliography appended comprises nearly 100 titles, besides references to numerous agricultural mycological periodicals.

TALIEFF (V. I.). Общая диагностика заболевания растений. [General symptomatology of plant diseases]—125 pp., 24 figs., Moscow & Leningrad, Госуд. С.-Хозяйств. Издат. [State Agric. Publications Office], 1930.

This is an elementary text-book on plant diseases and insect pests in Russia, dealing chiefly with the symptomatology of the troubles. Most of the illustrations are original.

KELLEY (A. P.). **II. Mycorhiza studies. The duration of certain Pine mycorhizae.**—*Journ. of Forestry*, xxviii, 6, pp. 849–852, 1930.

The writer's studies of certain pine mycorrhiza from the eastern United States and Minnesota have revealed the presence of living mycorrhiza at all seasons of the year, while the microscopic examination of living roots in glass boxes indicates that elongation of the root never ceases entirely even during the winter.

An adequate water supply is an essential condition of mycorrhizal development. The white mycorrhizal root-tips make rapid growth after rain, and fungus hyphae are usually to be found in the tissues. Finally, all or most of the root endings assume a rounded or coralloid aspect and turn darker in colour; these changes are tentatively attributed to the production of substances inhibiting meristematic activity and causing a darkening of the hyphae. Pericyclic cork is also formed and the mycorrhiza appear as nearly black, brittle, shrivelled, dead-looking structures. Under favourable moisture and temperature conditions, however, these apparently dead mycorrhiza may resume active growth, producing white tips which develop into new mycorrhizal rootlets. Alternate freezing and thawing seem to destroy the mycorrhiza. Some red, Scotch, and white pine [*Pinus resinosa*, *P. sylvestris*, and *P. strobus*] seedlings at Gunpowder Falls, Maryland, which failed to grow for no apparent reason, were found to be planted so shallowly that the roots had formed laterally just below the bare soil. Many of the mycorrhiza were frozen and dead, and would evidently be unable to withstand desiccation during the summer.

PETRI (L.). **Osservazioni biologiche sulla 'Blepharospora cambivora'.** [Biological observations on *Blepharospora cambivora*.]—Reprinted from *Ann. R. Ist. Sup. Agrario e Forestale*, Ser. 2ª, i, 7 pp., 3 figs., 1925. [Received December, 1930.]

In the spring of 1925, the author observed that the zoosporangia of *Blepharospora* [*Phytophthora*] *cambivora* [*R.A.M.*, ix, p. 353] took three or four times as long to form in the light as they did in the dark. Their development was not appreciably retarded by yellow or red light, but was inhibited by blue light, this negative action of the actinic rays being weaker on very young mycelium,

though even with this there was a noticeable difference in the length of time required for the formation of the zoosporangia in darkness and light, respectively.

In cultures in mineral nutrient solutions the zoosporangia were actively formed only at night, the zoospores being differentiated and released from the sporangium in the morning. The actinic rays actively stimulated the differentiation and development of the zoospores, whereas red rays had an inhibiting effect, as also had yellow rays when the absorbing power of the screen was high. The appreciable positive phototropism of the zoospores was easily demonstrated in preparations illuminated unilaterally.

Evidence was obtained that in nature the zoosporangia form on the surface of the soil during the night, while during the day all that takes place is the differentiation and liberation of the zoospores. Ordinary light did not retard the germination of the zoospores, which after a period of mobility lasting for two or more hours passed into the resting stage, and then germinated by a very thin, unbranched hypha.

The sexual organs were observed to form in cultures on carrot decoction agar treated with malic acid, on which medium a thin velvety layer formed after about one month and adhered tightly to the surface of the agar; in this the oogonia and antheridia developed. The former were easily visible, being ochraceous-yellow and measuring 57 to 62 μ in diameter; the antheridium was invariably amphigynous and had a wide septum situated about the middle of the neck of the oogonium.

Mature oospores were not obtained in culture, but the evidence gathered was sufficient to establish the close affinity of the genus *Blepharospora* with *Phytophthora.*

In the author's opinion, it is probable that the swollen hyphae or vesicles (which possess a thickened wall) characteristic of *Blepharospora* may assist in the conservation of the mycelium when it is unable to form sexual organs. The extraordinary profusion of these vesicles containing reserve material in a strain of *Blepharospora* isolated by Dufrénoy from diseased chestnuts at St. Féreole would appear to be associated with the almost constant sterility of this form.

RIEDE (W.). **Der Abbau der Kartoffel.** [Potato degeneration.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxi, 15–22, pp. 321–334, 1930.

This is a theoretical discussion on the nature and etiology of degeneration in potatoes [cf. *R.A.M.*, ix, p. 122], in which the conclusion is reached that the phenomenon is a purely temporary and reversible condition induced by unfavourable environmental factors and quite distinct from the deterioration due to segregation, mutation, or inbreeding. Since the former type of degeneration is confined to certain individuals within a given variety, much may be done to improve the condition of the crop by selection. It is also most important to procure seed from healthy sources (dry, sandy situations). Prolific varieties being mostly inclined to degeneration, an attempt should be made to rectify the latter tendency by hybridization.

Köck [G.]. **Massenauslese als Mittel gegen den Abbau.** [Mass selection as a remedy for degeneration.]—*Oesterr. Zeitschr für Kartoffelbau, 1930,* 3, pp. 45–47, 1930.

Popular notes are given on leaf roll and mosaic of potatoes in Austria and on their control by mass selection [cf. *R.A.M.*, ix, p. 602].

Blattný (C.). **Pokus s pasáži viru Bramborů.** [Experiment on the passage of Potato virus.]—*Ochrana Rostlin,* x, 3 pp. 65–70, 3 figs., 1930.

The results of some of a series of experiments [very brief details of which are given] made in 1930 showed that when a piece of potato tuber of the variety Görsdorfska Ledvinka [Görsdorf Kidney] affected with mild mosaic of the Magnum Bonum type was grafted on a tuber of the Jánovka variety (which is apparently immune from this form of mosaic), the shoots developed from the latter did not exhibit any symptoms of the disease, while those arising from the graft reproduced the original form of mosaic. When a piece of diseased Görsdorfska Ledvinka tuber was inserted in a healthy Magnum Bonum tuber (the freedom of which from mosaic had been confirmed by several years of cultivation), mild mosaic developed in all the shoots produced by both portions of the tuber graft, the symptoms appearing, however, somewhat later in the shoots from the Magnum Bonum portion than in those of the graft. Finally, when a tuber section of the Jánovka variety was inserted between a basal tuber portion of the diseased Görsdorfska Ledvinka variety and an apical portion of a healthy Magnum Bonum tuber, the shoots developing from the latter exhibited very severe mosaic, those produced by the Jánovka section showed no symptoms at all, and those arising from the Görsdorfska Ledvinka portion reproduced the initial mild form. It is pointed out that in every case where the grafts succeeded the union was 'mechanical', and a slight layer of cork was formed at the junction of the grafts. The experiments showed that the mosaic virus tested was able to pass through this corky layer and infect the healthy Magnum Bonum portion of the grafts; as indicated, however, by tests with methylene blue, the quantity of virus that traversed this layer must have been very small, an observation which leads the author to interpret the result in the case of the severe mosaic that developed in Magnum Bonum shoots in the last-described experiments as pointing to a proliferation of the virus either in the Jánovka or the Magnum Bonum section. The experiment also showed that the virulence of the virus was considerably enhanced by its passage through the apparently immune Jánovka variety, as judged by the severity of the symptoms on Magnum Bonum shoots. Finally, it confirmed the belief that the immunity of the Jánovka variety is only apparent, since the virus may be present in the tuber without causing the appearance of any visible symptoms in the growing plant; a further confirmation of this fact is supplied by field observations which showed that healthy Görsdorfska Ledvinka plants grown alongside apparently healthy Jánovka plants in four years developed 97 per cent. mild mosaic, while the same line of

the former only developed 63 per cent. mosaic during the same period when grown in the same locality together with other local commercial potato varieties.

KŘÍŽ (K.). **Naše krajové Bramborové odrůdy imuní vůči rakovině Bramborů.** [Our local Potato varieties immune from Potato wart disease.]—*Ochrana Rostlin*, x, 3, pp. 70–73, 1930.

The main feature of interest in this paper is a descriptive list of 12 Czecho-Slovakian varieties of potatoes which were shown in severe tests over three years at Šluknov [cf. *R.A.M.*, viii, p. 595] to be immune from potato wart disease (*Synchytrium endobioticum*). Two of these varieties, namely, Pakläk and Červená Cibule [Red Onion], were tried in 1929 for their agricultural qualities in five different localities, and proved to be very productive in the field. Pakläk, in particular, possessed outstanding table qualities.

K[ÖCK (G.)]. **Ein neues Auftreten des Kartoffelkrebses in Steiermark.** [A fresh occurrence of Potato wart in Styria.]—*Oesterr. Zeitschr. für Kartoffelbau, 1930*, 3, p. 54, 1930.

A fresh outbreak of potato wart [*Synchytrium endobioticum*] has been notified to the Austrian plant protection authorities from Hasendorf, near Kapsenberg, Styria [*R.A.M.*, ix, p. 334].

LEACH (J. G.). **The identity of the Potato blackleg pathogene.**—*Phytopath.*, xx, 9, pp. 743–751, 1930.

The similarity of the bacteria causing potato blackleg to *Bacillus carotovorus*, the organism responsible for soft rot of carrots, induced the writer to make a comparative study, at St. Paul, Minnesota, of numerous strains of allied phytopathogenic bacteria causing soft rot [cf. *R.A.M.*, viii, p. 396]. A comparison of the morphological, physiological, and parasitic characteristics of these cultures showed slight grounds for the recognition of different species within the group. All the bacteria studied were equally pathogenic to potatoes, carrots, onions, celery, cabbage, and iris, and were identical in primary characters. A fairly large number of strains varied in minor characteristics, but no evidence was obtained of pathogenic differences between those isolated from potatoes and those originating in other hosts. While agreeing, therefore, with Stapp's view [loc. cit.] that all may be included in one species, the author is unable to accept the reasons therein advanced for discarding the priority of the name *B. carotovorus* Jones. The conclusion is reached that blackleg is simply a form of soft rot of potato, the organisms previously designated as *B. phytophthorus* Appel, *B. atrosepticus* van Hall, *B. solanisaprus* Harrison, and *B. melanogenes* Peth. & Murphy being merely strains of the earlier described *B. carotovorus* Jones.

HOWITT (J. E.). **Increased yields from spraying and dusting late Potatoes (abstract).**—*Proc. Canadian Phytopath. Soc., 1929*, pp. 19–20, 1930.

The results of two years' experiments on the spraying and dusting of late potatoes (Dooley and Green Mountain) in Ontario showed that both treatments increased the yield, liquid Bordeaux

(4–8–40) being superior to copper-lime dust both in 1928 and 1929 [*R.A.M.*, viii, p. 400]. In the former year, the increased yields appear to have been due to the preventive action of the fungicides on late blight and rot [*Phytophthora infestans*], while in 1929, when no fungous diseases developed, they were correlated with the absence of tip burn in the treated plots. In 1928 the yields were as follows: Bordeaux mixture 291 bushels per acre, copper-lime dust 255·5, and control 194·5, the corresponding figures in 1929 being 235, 193, and 156 bushels per acre, respectively.

REILING (H.). **Einfluss einiger Faktoren auf Krankheitserscheinungen der Kartoffelknolle.** [Influence of some factors on disease symptoms in the Potato tuber.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, B, ix, 9, pp. 393–397, 7 figs., 1930.

Some further notes are given on the occurrence of scab [*Actinomyces scabies*], scurf (*Rhizoctonia* [*Corticium*] *solani*), and sprain in potato tubers under German conditions [*R.A.M.*, ix, p. 199]. The two first-named diseases were found to occur in slightly alkaline and slightly acid soils, respectively, but a case was observed in which both fungi occurred on the same tuber, indicating that their range of acidity toleration is wider than has generally been supposed. Sprain occurred in a fairly acid soil.

MURRAY (R. K. S.). **Some common pests and diseases of young Hevea buddings.**—*Trop. Agriculturist*, lxxv, 3, pp. 159–161, 1930.

The author states that the two fungal diseases most to be feared in Ceylon in bud-grafted *Hevea* rubber nurseries are *Oidium* [*heveae*: *R.A.M.*, ix. p 674] and *Phytophthora palmivora* [ibid., ix, p. 673]. The control measures recommended are the dusting of all young shoots with sulphur every ten days in dry weather against *O. heveae*, and spraying with 0·66 per cent. Bordeaux mixture every week or ten days during wet weather. These treatments also afford a fair degree of control against insect and other animal pests which attack young buds and shoots, and a list of which is given.

[This paper is also published in the *Third Quarterly Circular for 1930, Rubber Research Scheme (Ceylon)*, vii, 3, pp. 51–53, 1930.]

MURRAY (R. K. S.). **A recent outbreak of Xylaria thwaitesii root disease.**—*Trop. Agriculturist*, lxxv, 3, pp. 157–158, 1930.

In noting the limited occurrence of *Xylaria thwaitesii* [*R.A.M.*, viii, p. 20] on *Hevea* rubber in Ceylon, where it has been apparently recorded so far only in the Kegalle district, the author gives a brief account of a severe outbreak of the fungus observed by him in 1930 in that district. In some of the affected trees only the lateral roots were attacked, while in others the disease had spread to the tap-root, and although the trees were still living and did not show any marked difference in their foliage, there is no doubt that they would have ultimately succumbed to the rot were it not that the progress of the disease was apparently checked by adequate treatment. The control measures recommended are the same as for

other root rots, and consist in the removal and destruction by fire *in situ* of all diseased roots, and the digging of isolation trenches around the infected areas.

[This paper is also published in the *Third Quarterly Circular for 1930, Rubber Research Scheme (Ceylon)*, vii, 3, pp. 49–50, 1930.]

SALMON (E. S.). **Thirteenth report on the trial of new varieties of Hops, 1929.**—*East Malling Res. Stat., Kent*, 14 pp., 1930.

During 1929, mosaic disease was again present in the hop gardens of East Malling Research Station [cf. *R.A.M.*, ix, p. 130], 76 hills of 'commercial' and 17 of 'new' varieties being attacked, the latter group consisting of OF 76, OF 27, O 34, X 37, X 77, R 3/35, and OD 13.

Owing to the hot, dry summer and the systematic removal of the basal and terminal spikes, there was only a slight attack of downy mildew [*Pseudoperonospora humuli*: ibid., ix, p. 558] on the cones, restricted to seven [named] varieties. Tests in collaboration with F. H. Beard and W. M. Ware [which are briefly described] with the variety Y 90 clearly demonstrated that spraying even heavily with 1 per cent Bordeaux mixture for the control of this disease when the hops were in full burr did not interfere with cone development. It is therefore considered that English commercial varieties are not likely to suffer injury if sprayed when a small amount of burr is present.

FISCHER (R.). **Der falsche Hopfenmehltau.** [Downy mildew of Hops.]—*Bundesanst. für Pflanzenschutz, Mitt.* 204, 2 pp., 1930.

Brief, popular notes are given on the symptoms and life-history of downy mildew of hops (*Pseudoperonospora humuli*) in Austria [*R.A.M.*, vii, pp. 671, 806], and on its control by cultural methods and spraying with Bordeaux mixture (1 per cent. at the beginning and end of the treatments, and 1·5 per cent. during June and July).

WILES (D. R. D.). **Report of the Plant Diseases Inspector for the year 1929–30.**—*Rept. Dept. of Sci. & Agric. Barbados for the year 1929-30*, pp. 115–117, 1930.

In 1929–30, mosaic disease of sugar-cane was considerably less prevalent in Barbados than it had been in either of the two previous years [cf. *R.A.M.*, ix, p. 560], owing chiefly to the distribution of healthy cuttings by the Department of Agriculture and to the absence of *Aphis maidis* consequent on a close season for sorghum and maize again being proclaimed.

The presence was reported for the first time in the Island of sugar-cane gummosis [*Bacterium vascularum*: ibid., ix, pp. 271, 680, 808], but the only symptoms hitherto noted are the characteristic leaf marking, no gum exudation having been observed. The varieties B. 374 and B. 417 remained fairly resistant even when growing in close proximity to severely affected Ba. 11,569 canes.

COOK (M. T.). **Gomosis de la Caña P.O.J. 2878 in Puerto Rico.** [Gummosis of P.O.J. 2878 Cane in Porto Rico.]—*Rev. Agric. Puerto Rico*, xxvi, 3, p. 102, 1930.

On 2nd August, 1930, some canes of the P.O.J. 2878 variety

affected by gummosis [*Bacterium vascularum*: see preceding abstract] were received at the Porto Rico Insular Experiment Station from Santa Barbara de Jayuya, 2,000 ft. above sea level. The symptoms were somewhat atypical, consisting in the death of the leaf tissues along the veins, sometimes accompanied by a necrotic condition of the margins, and the exudation from the cut canes in a damp atmosphere of a pale to cream or yellow gum instead of the usual honey-coloured liquid. The effects of the disease on P.O.J. 2878 seem to be less severe than those occurring on Cristalina.

BELL (A. F.). **Bureau of Sugar Experiment Stations. Gumming disease in the Bundaberg district.**—*Australian Sugar Journ.*, xxii, 6, p. 351, 1930.

The past season has proved very favourable to the spread of gumming disease of sugar-cane [*Bacterium vascularum*: see preceding abstracts] in the Bundaberg district of Queensland. In a germination trial of 1900 Seedling cane in 1929, plantings were made of (*a*) healthy canes, (*b*) diseased cane, and (*c*) knife-infected cane, in which healthy setts were cut alternately with diseased ones. The following germination percentages were obtained: healthy 92, diseased 3, and knife-infected 68. In addition to reducing germination by 30 per cent., the use of an infected knife caused the transmission of gumming to a number of canes which did grow. The Coimbatore canes, especially Co. 210, have maintained their high degree of resistance to gumming. Co. 213, however, is somewhat susceptible to mosaic.

CHRISTOPHER (W. N.) & EDGERTON (C. W.). **Bacterial stripe diseases of Sugar Cane in Louisiana.**—*Journ. Agric. Res.*, xli, 3, pp. 259–267, 2 figs., 1930.

Field investigations have shown the existence in Louisiana of three distinct bacterial stripe diseases of the sugar-cane, namely, red stripe and top rot [a preliminary account of which was given in a previous paper: *R.A.M.*, vii, p. 59], mottled stripe, and white stripe. In giving a brief description of the symptoms of the red stripe and top rot disease (the most important of the three in Louisiana), the authors state that the organism isolated from the lesions closely resembles *Phytomonas rubrilineans* [loc. cit.] in all main details, and until disproved by further work this name is adopted for the Louisiana organism. Inoculation experiments showed that the P.O.J. varieties 2727, 2725, and 826 are very susceptible to the disease, while the D–74 and P.O.J. 36, 36–M, 234, and 213 are only moderately so, and it is not thought probable that the disease will ever become serious on these varieties.

Mottled stripe is primarily a disease of the leaf blade, on which the stripes are predominantly red in colour, though frequently white areas or white margins occur. The stripes run parallel to the leaf veins and range in length from very short up to a metre or more and from 1 to 4 mm. in width. In coalescing the stripes occasionally form mottled red and white bands. No bacterial exudation has been observed on the leaves. The causal organism, which is present in the affected tissues in large numbers, is a short,

motile rod, slightly curved, with rounded ends and polar flagella, occurring singly, in pairs, or rarely in short chains, non-sporiferous, but forming capsules on dextrose media; it is aerobic, Gram-negative, not acid-fast, and its optimum temperature for growth is 30° C. and optimum reaction P_H 6·8 to 8. It is considered to be new to science and the name *P. rubrisubalbicans* is suggested for it. A technical description is appended. Inoculation experiments showed that the varieties manifesting considerable resistance to the disease include the P.O.J. varieties 36, 36–M, 234, 213, 228, and 979, as well as Co–281, and the CP seedlings 130, 177, and 807. The mottled stripe disease was transmitted to Johnson grass (*Holcus* [*Andropogon*] *halepensis*) and to sorghum, but not to maize.

White stripe disease is not dealt with in this paper as it is apparently of small economic importance and no causal organism has, as yet, been isolated.

PICBAUER (R.). **Additamentum ad floram Jugoslaviae mycologicam.** [Addition to the mycological flora of Jugo-Slavia.]—*Glasnik Zemaljskog Muzeja u Bosni i Hercegovini* [*Journ. Bosnia and Herzegovina Land Museum*], Sarajevo, xli, 1, pp. 29–34, 1 fig., 1929. [Received December, 1930.]

This is a Latin enumeration of 73 species of fungi, arranged in systematic order, which were collected in recent years in Bosnia and Montenegro. The host plant and locality are indicated in every case. With few exceptions the parasitic fungi recorded occurred on plants of no economic importance.

STEVENS (F. L.). **Parasitic fungi from Panama.**—*Ann. Myc.*, xxviii, 3–4, pp. 281–286, 5 figs., 1930.

Taxonomic and geographical notes are given on 33 species of parasitic fungi from Panama, mostly collected by the author during 1924 [cf. *R.A.M.*, vii, p. 743]. The three new species are furnished with diagnoses in English.

NANNIZZI (A.). **Note micologiche.** [Mycological notes.]—*Atti R. Accad. Fisiocritici Siena*, Ser. x, v, 3, pp. 72–79, 1930.

Critical notes are given on the following fungi recently observed for the first time in the environs of Siena. *Oospora verticillioides* [*R.A.M.*, viii, p. 339] was found in profusion in split grains of maize, causing considerable damage. The white mycelium and the masses of pink or white conidia developing from it are plainly visible against the golden-yellow of the grain.

Couturea castagnei Desm., occurring on olives and *Rosmarinus officinalis*, is characterized in nature by pycnidia with a well-marked ostiole, 10 to 12 μ in width (differing in this respect from previous descriptions), containing not only uni- to tri-septate pycnospores but also continuous, hyaline or pale olivaceous ones measuring 4·5 to 6 by 2·5 μ and others having three transverse and one or two longitudinal septa and measuring 12 to 13 by 6 to 7 μ or 15·5 by 7 to 7·5 μ. In culture (glucose agar with a decoction of

olive leaves) the fungus forms a greyish-green or brownish mycelium, composed of hyphae with a diameter of 2·5 to 7 μ and of hyaline, erect conidiophores bearing at their apices hyaline or pale olivaceous, tri-septate, cylindrical, or clavate conidia, 24 to 35 by 7 to 8 μ in diameter; pycnidia were not obtained.

Cercospora campi-silii Speg. was found producing angular, oval, whitish to brown spots, with a reddish-brown margin, on the leaves of *Impatiens noli-tangere.* The parasitized tissues become extremely brittle and are ultimately torn. The olivaceous conidiophores measure 50 to 80 by 3 to 7 μ and the olivaceous conidia, with one to four transverse septa, 20 to 50 by 4 to 8 μ.

C. cladosporioides, characterized by filiform, pale olivaceous conidiophores, 200 to 300 by 4 μ, and 3- to 5-septate, cylindrical conidia, 28 to 40 by 5 μ, was found causing leaf fall of olives, both in association with *Cycloconium* [*oleaginum*: ibid., viii, p. 185] and alone. The mycelium penetrates the leaves through the stomatal openings; conidial formation begins on the leaves while still attached to the tree and continues with increased activity after they fall. The spots produced on the leaves are leaden-grey at first, turning brown and finally black; the upper side assumes a yellowish tinge and subsequently dries up.

Agave americana was attacked by an organism apparently identical with *Tylogonus agaves*, described by Miliarakis from Greece in 1888. The tissues of the affected leaves, which were covered with yellow or brown spots, were found to contain gelatinous masses resembling plasmodia, while the mesophyll cells were occupied by hyaline to yellow, single or agglomerated, sporiform corpuscles measuring 2·5 to 4 μ in diameter.

OVERHOLTS (L. O.). **Mycological notes for 1928–1929.**—*Mycologia*, xxii, 5, pp. 232–246, 4 pl., 1930.

In this further series of notes [*R.A.M.*, ix, p. 204] the following references, amongst others, are of phytopathological interest. *Alternaria dianthi* [ibid., viii, pp. 518, 723] was observed in 1929 to be causing considerable damage [to *Dianthus*] in a greenhouse in Reading, Pennsylvania. The stems of the diseased plants were usually cankered in the lower half and soon died. The whitened lesions bore abundant conidiophores, short, erect, and in tufts, outwardly resembling *Colletotrichum* acervuli. The spores, which are markedly constricted at the septa and often have considerably bulging middle cells, were somewhat shorter (45 to 72 by 12 to 19 μ) than indicated in the diagnosis given by Stevens and Hall. Specimens of *Antirrhinum majus* from Upper Darby, Pennsylvania, were observed bearing conspicuous cankers on the stem near the ground line, the causal organism of which was identified as *Phoma oleracea* [*P. lingam*: ibid., vi, p. 329] var. *antirrhini* as described by Saccardo. The pycnidia are cortical, erumpent, numerous, black, compressed-globose or globose, and 100 to 125 μ in diameter. The conidiophores are short and inconspicuous. The conidia are oblong or oblong-elliptical, smooth, hyaline, continuous, and measure 4 to 6 by 2 to 2·5 μ. The relationship of this fungus to the cabbage parasite was not investigated.

SAVULESCU (T.) & RAYSS (T.). **Contribution à la connaissance des Péronosporacées de Roumanie.** [Contribution to the knowledge of the Peronosporaceae of Rumania.]—*Ann. Myc.*, xxviii, 3–4, pp. 297–320, 8 figs., 7 graphs, 1930.

Taxonomic and geographical notes are given on 98 species of Peronosporaceae collected by the authors in Rumania. The list includes six new species, diagnoses of which are given in Latin, and eight new forms of *Cystopus candidus* [*R.A.M.*, ix, pp. 573, 737]. Frequency curves of the conidial dimensions of the new species are given.

LENDNER (A.). **Détermination de Mucorinées. (Deux Mucors nouveaux.)** [Identification of Mucoraceae. (Two new species of *Mucor*).]—*Bull. Soc. Bot. de Genève*, 2me Sér., 2, pp. 256–263, 4 figs., 1930.

In giving a list of, and a few notes on, a number of Mucoraceae which were sent him for identification from abroad, the author states that among them he found two species which he considers to be new to science. The first, which is named *Mucor indicus*, and which was received from Ajrekar from India, is presumably a soil-inhabiting fungus; in its behaviour in fermentable liquids it is very like Wehmer's *M. javanicus*, but differs from the latter in its constantly smaller spores and in the shorter aerial growth. The second species, named *M. buntingii*, was isolated in the Gold Coast by Bunting from heaped-up cacao seeds on which it appears to be very common. In pure culture the fungus was found by S. F. Ashby, from whom the cultures were received, to grow very slowly at temperatures below 25° C., but to develop vigorously at temperatures between 38° and 50°, the higher temperature appearing to be the most favourable.

Brief Latin diagnoses of both new species are given.

ATANASOFF (D.). Болести по Тютюна. [Tobacco diseases.]—140 pp., 1 col. pl., 26 figs., Sofia, Държавна Печатница [Government Printing Office], 1930.

This is an account of the physiological disorders and parasitic diseases of tobacco which are known to occur in the Balkans, and most of which have been noticed from time to time in this *Review*. A useful bibliography is appended to the description of each disease and includes the most recent researches on it. The book terminates with a list of 37 diseases of tobacco which occur outside Bulgaria together with their geographical distribution.

NELSON (N. T.) & MAJOR (T. G.). **Tobacco Division Report covering the period 1927–1929.**—Issued by the *Canada Dept. of Agric.*, 36 pp., 1 fig., 1930.

Brief notes are given (pp. 31–33) on the incidence of the following diseases of tobacco in Canada during the period under review. Black root rot (*Thielavia basicola*) [*R.A.M.*, vi, p. 585; vii, p. 348] caused heavy losses in the Assomption-Montcalm district of Quebec in 1927 on account of the wet, cool weather during August. In 1928 and 1929 the dark and Burley varieties were most severely attacked, and it is believed that the almost

exclusive use of Resistant Havana (142) will be necessary in future. In 1928 wildfire (*Bacterium tabacum*), which was first found in the Yamaska Valley of Quebec in 1925 [ibid., iii, p. 442], occurred on over 30 farms in Rouville Co., Quebec, compared with 6 in 1927, while one case was reported from Montcalm Co., north of Montreal. Angular leaf spot (*Bact. angulatum*) [ibid., iii, p. 443] caused considerable damage in Ontario and Quebec in 1927 and 1928; in 1929 the Belge variety was chiefly affected. Mosaic [ibid., vii, p. 347] was present in widely varying percentages in the Yamaska Valley during 1928. Frenching [ibid., viii, p. 473] was responsible for very serious damage in a few fields in British Columbia in 1927. Appreciable losses were caused by curly dwarf [ibid., vii, p. 276] in British Columbia in 1927. Leaf drop [ibid., viii, p. 409] occurred in the Okanagan Valley of British Columbia in 1928 and 1929, causing heavy losses in the former year.

DUFRÉNOY (J.). **Maladies à virus du Tabac.** [Virus diseases of Tobacco.]—*Phytopath. Zeitschr.*, ii, 4, pp. 321–339, 13 figs., 1930.

Continuing his researches on the cytology of tobacco mosaic [*R.A.M.*, ix, p. 209], the writer found that the extent of the cytoplasmic modifications in affected leaves depends on the duration of survival of the diseased cells. The cells that are killed suddenly undergo a kind of 'histological fixation', their chloroplasts remaining filled with starch grains. When the affected cell survives for some time, the vacuolar system is the first part of the leaf to manifest pathological alterations. In the brown spot ('taches brunes') disease, and sometimes also in white and ring spot ('taches blanches' [ibid., viii, p. 678] and 'taches en anneau') the vacuolar system accumulates phenolic compounds and the cell dies rapidly. However, the cells surrounding the ring spots and those in the layers of perivascular discoloration are limited to a few centres of proteolysis, marked by groups of small filamentous vacuoles.

LÜDTKE (M.). **Beiträge zur Kenntnis des Stoffwechsels mosaikkranker und gesunder Tabakpflanzen.** [Contributions to the knowledge of the metabolism of mosaic-diseased and healthy Tobacco plants.]—*Phytopath. Zeitschr.*, ii, 4, pp. 341–359, 1930.

The results [which are fully discussed and tabulated] of chemical analyses of healthy and mosaic tobacco plants showed that the accumulation of starch in the latter [see preceding abstract] is not due to a disturbance or reduction in diastatic activity, which is, in fact, greater in the diseased than in the healthy organism. A cane sugar- and peptone-splitting enzyme displayed equal activity in healthy and mosaic plants. Enzymes of pepsin- and papain-like nature were absent, nor was there any trace of a glycyl-glycine dipeptidase. These data would appear to dispose of the theory that tobacco mosaic results from a disturbance of enzymatic activity.

The leaf albumin of the tobacco leaf cannot be present in forms

susceptible to the action of pepsin and papain. Gelatine was not split up by the leaf enzymes; only in two cases could a very slight increase of the NH_2 value be detected. The injection of isoamylin (0·1, 1, and 5 per cent.) into tobacco plants failed to induce any symptoms resembling mosaic, and the so-called 'albinism' attributed to this substance (*Gazz. Chim. Ital.*, l(ii), p. 13, 1920) therefore bears no relation to the virus diseases. No alteration was observed in the pectin substance of mosaic leaves as compared with those of normal plants.

CLARA (F. M.). **A new bacterial leaf disease of Tobacco in the Philippines.**—*Phytopath.*, xx, 9, pp. 691–706, 3 figs., 1930.

In December, 1925, a bacterial leaf spot of tobacco somewhat resembling wildfire [*Bacterium tabacum*] was observed in the seed-beds and later in the fields of the Ilagan Tobacco Experiment Station, Isabella, Luzon. Subsequently the same disease [originally attributed to *Phytomonas tabaceara*: *R.A.M.*, viii, p. 25] was found in several localities of the Cagayan Valley and on one of the Visayan Islands. On seedlings the spots are generally opaque and without the typical yellow halo of wildfire, which is sometimes present, however, on older plants. Further studies revealed certain analogies between the Philippine disease and the Wisconsin leaf spot (*P. mellea*) [*Bact. melleum*: *R.A.M.*, x, p. 62].

The damage caused by this leaf spot is considerable. During 1925–6 seedlings grown in seed flats showed 50 to 90 per cent. infection even where the soil was sterilized with formaldehyde. When the diseased seedlings were transplanted to the field, a large number developed such severe symptoms that at harvesting the leaves were found to be useless for high-grade wrappers. In cases of heavy infection the young seedlings develop a kind of wet rot similar to bed rot (*Pythium de Baryanum* and *Sclerotium rolfsii*), but distinguishable from the latter disease by the opaque or bleached white spots visible on both surfaces and sometimes causing complete necrosis so that holes are formed in the leaf. When infection occurs on the petioles and stems the plants are rapidly killed. In the field also the spots are generally white or opaque, but they may be brown and zonate; the occasional yellow halo referred to above disappears with advancing maturity. The disease is more virulent on the lower and middle than on the upper leaves.

The causal organism, which is named *Phytomonas polycolor* n. sp. with a technical diagnosis in English, is fully described, its chief differences from *Bact. melleum* being discussed and shown in tabular form, while attention is further drawn to certain similarities with other phytopathogenic bacteria. *P. polycolor* is rod-shaped with rounded ends, occurring singly, in pairs, or in chains, measuring on an average 2·68 by 1·27 μ, motile by one to three mono- or lophotrichous flagella two or three times longer than the body; it is Gram-negative, non-acid-fast, is a facultative anaerobe, and is markedly fluorescent with a yellowish or bluish-green tinge according to the medium. The organism liquefies gelatine and Loeffler's blood serum, ferments xylose, arabinose, and mannose, and produces hydrogen sulphide on basic lead acetate agar. Its

optimum temperature for growth is 25° to 30° C., with a maximum at 37° to 39°. Inoculation experiments with bacterial suspensions or smears on tobacco plants of various ages gave positive results.

Encouraging results were given by seed disinfection tests with silver nitrate (1 in 1,000 for 10 to 15 minutes).

PITTMAN (H. A.). **An outbreak of 'downy mildew' (so-called 'blue mould') of Tobacco in Western Australia.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., vii, pp. 469–476, 2 figs., 1930.

This brief, semi-popular account of downy mildew or blue mould (*Peronospora* sp.) [*R.A.M.*, ix, p. 811] of tobacco is published in view of an outbreak of the disease in 1930 at Manjimup, Western Australia, the first recorded in the State. Field observations indicated, however, that the disease had apparently been present in a mild form for several years, and that infection in the earliest sown seed-beds had occurred from diseased tobacco volunteer plants overwintering in a field near by. Since the fungus is now known to be seed-borne [ibid., ix, p. 140], it is believed that it was introduced into Western Australia with seed from other Australian States, where the disease is prevalent and of long standing. For this reason steps are being taken to prevent the importation into Western Australia of tobacco seed except for Departmental purposes, and also to prohibit the sale or distribution of locally produced seed, unless previously disinfected in absolute alcohol under the supervision of the Department of Agriculture.

A considerable portion of the paper is dedicated to control measures which are based on the present knowledge of the disease. These consist mainly in the disinfection of seed-bed soil and of the seed, strict sanitation of the seed-beds and of the fields, including thorough destruction of all tobacco volunteers from preceding crops, and also of plants of the native tobacco, *Nicotiana suaveolens* (which has been shown to be susceptible to blue mould), and a crop rotation of at least three years' duration. In the seed-beds outbreaks of the disease may be controlled by dusting the under side of the leaves with copper carbonate-sulphur dust, and in the field by spraying the plants with 3–3–50 Bordeaux mixture plus ½ lb. calcium caseinate to 50 gallons of the spray. As the disease may also be spread by insects and human beings, the necessary precautions against this form of distribution are also indicated.

MURWIN (H. F.), CLINTON (G. P.), & ANDERSON (P. J.). **Field experiments on brown root rot.**—*ex* Tobacco Substation at Windsor: report for 1929.—*Connecticut Agric. Exper. Stat. Bull.* 311, pp. 247–255, 2 graphs, 1930.

During the seasons 1925–28, inclusive, field experiments on brown root rot of tobacco [*R.A.M.*, ix, pp. 22, 629] were conducted on a badly infected acre on a farm at Poquonock. Under the conditions of the tests, the disease was found to be most severe when following timothy [*Phleum pratense*], maize, rye, lucerne, or clover, potatoes being less injurious in this respect, while with continuous tobacco culture the damage was reduced to a minimum. Fallowing without fertilization was found to produce the same

effect as continuous tobacco culture, while abandoning the land to the natural weed growth for a year was more beneficial than either. Additions of stable manure increased the yield on the field under observation, and annual applications of lime also gave good results. The use of an acid fertilizer reduced the incidence of infection on the roots, but did not increase the yield because the soil was rendered too acid for good growth. Complete elimination of infection was secured by steaming or thoroughly aerating the soil, sterilization with formaldehyde being less efficacious for this purpose.

WOLF (J. G.). **Black rootrot resistant shade Tobacco.**—*ex* Tobacco Substation at Windsor: report for 1929.—*Connecticut Agric. Exper. Stat. Bull.* 311, pp. 256–263, 3 figs., 1930.

A strain of Cuban shade tobacco (4 R) highly resistant to black root rot (*Thielavia basicola*) [*R.A.M.*, ix, p. 629], but otherwise similar to ordinary plants of the same type, has been isolated and tested for two years in a Connecticut field where the disease was very severe. The seed was originally brought from Cuba, and the present stock is the progeny of one selected plant, so that the resistant individuals can hardly have arisen through segregation in a hybrid population. The uniformity of the plants is a further argument in favour of a definite mutation. Resistance to root rot in this strain is not always absolute, the extent of infection being influenced by environmental conditions. The leaves in the resistant strain are longer and wider than those of the susceptible ones, while the yield of the former at the first picking in 1929 was 340 lb. per acre compared with only 175 for the latter.

BOLAS (B. D.) & BEWLEY (W. F.). **Aucuba or yellow mosaic of the Tomato: a note on metabolism.**—*Nature*, cxxvi, 3178, p. 471, 1 fig., 1930.

A study of tomato plants suffering from aucuba mosaic [*R.A.M.*, ix, p. 417] at the Cheshunt (Herts) Experimental and Research Station has shown that, in the early stages of the disease, the removal of starch from the leaves is greatly accelerated (except at the points of infection) in plants placed in the dark. The local inhibition of starch removal at the points of infection is followed, often in about 14 days, by the disappearance of starch over a larger area of the inoculated leaf, slight yellowing of the chlorophyll, and failure of starch formation over the corresponding area in the light.

The acidity of an aqueous extract of infected leaves sampled at dawn, i. e. immediately after loss of starch, is greater than that from healthy ones. A local absence of starch in the leaves, even during the day, appears to precede the development of mosaic symptoms. The freshly discoloured chlorophyll seems to react with copper salts, regenerating a green colour. At a later stage of infection a marked accumulation of starch is found in some parts of the affected leaves and complete absence in others.

On the basis of these studies the authors suggest that the action of the virus on the starch is the production of acids which (1) react with nitrogen to form protein, (2) attack the chlorophyll causing

mottling, and (3) affect respiration with the formation of carbon dioxide.

FENNER (L. M.). **Bacterial canker of Tomato. A survey in Copiah, Hinds and Rankin Counties, Mississippi, May 6 to June 10, 1930.**—*Plant Disease Reporter*, xiv, 15, pp. 134–140, 2 pl. [in No. 16], 1 map, 1930. [Mimeographed.]

This account of the recent survey of some important tomato-growing sections of Mississippi for the presence of bacterial canker [*Aplanobacter michiganense*: see above, p. 84] is based on data obtained in over 250 fields, covering an area of more than 600 acres. There was no indication that any of the cultural methods commonly practised in the State [full details of which are given] were responsible for the wide distribution of the disease, which is attributed to the use of contaminated tomato seed from certain external sources. Mississippi-grown seed produced healthy plants.

The disease occurred in an extremely destructive form during 1930, the estimated loss per acre being $300 to $600 or in some cases up to $800. In fields showing 20 to 60 per cent. infection only 10 to 20 per cent. of a normal crop was harvested, while in other cases there was a total loss. In 1929 the losses were even greater owing to the heavier rainfall, which in 1930 was exceptionally low.

No sign of resistance to canker was shown by the tomato varieties ordinarily cultivated in Mississippi, viz. Globe, Gulf State Market, and Crystal Springs Market. The chief measure of control is the use of clean seed. Great care should also be exercised in the sanitation of the hotbeds and the selection of fresh sites, which should be renewed every year. No admixture of refuse from tomato fields should be allowed in the farm-yard compost, and it must also be remembered that all manures from external sources may possibly harbour the canker organism. Crop rotation on a five-year system is recommended for general practice. Only partial control has been given by seed treatment with corrosive sublimate (1 in 3,000, five minutes' immersion), which destroys the bacteria on but not under the seed coat. Roguing in the field at an early date may be effective where the incidence of infection does not exceed 1 to 5 per cent.

THOMAS (R. C.). **The canker disease of Tomato.**—*Ohio Agric. Exper. Stat. Bull.* 145, pp. 116–122, 3 figs., 1930.

Bacterial canker of tomatoes [*Aplanobacter michiganense*: see preceding abstract] has been present in Ohio greenhouses for the past six or seven years, and though in the localities concerned it has never caused appreciable losses in the field, under greenhouse conditions plants which become diseased in the seedling stage or before the first cluster is set usually give no yield. In 1927, 50 plants were inoculated in the field just before the setting of the first fruit·cluster; the inoculations were successful in every case but the plants became only slightly affected. Similar results were obtained from a further test the year following. When the tests were duplicated in the greenhouse, however, all the inoculated

plants died a month to six weeks after inoculation, the yield being only 15 per cent. of the normal.

After briefly noting the symptoms of the disease and the fact that it is seed-borne, the author states that in 1929, 200 plants grown from seed taken from diseased fruit were transferred from the greenhouse to the field when about 8 in. high. All grew well and produced fruit, but when the basal portions of the stems were examined 30 per cent. of the plants were found to be affected.

Healthy plants grown in soil from which a diseased crop has been taken usually contract the disease. The bacteria appear to survive in the soil indefinitely; the disease is still present in the soil in the vicinity of the Grand Rapids, where it was first detected nearly 20 years ago.

That the canker is spread while suckering was demonstrated by the fact that four weeks after 50 plants had been suckered in the usual way and a few drops of a pure culture of the bacterium placed on the wounds, 75 per cent. became infested. When other plants were suckered after the juice from badly diseased plants had been smeared on the fingers, 50 per cent. of the plants developed typical canker symptoms.

Control consists mainly in using clean seed and promptly removing all infested matter; in severe epidemics in the greenhouse the soil should be sterilized by steam.

HUBERT (E. E.). **Forest pathology.**—*Science*, N. S., lxxii, 1867, pp. 351–356, 1930.

This is a survey in general terms of the present status of forest pathology in the United States. The aspects discussed include the economic losses caused by tree parasites (chiefly mistletoes and fungi), the relation of such losses to forest depletion, and the control of disease in trees and their products by four methods, viz. the application of quarantine and inspection measures, the removal and destruction of infected material or of alternate hosts, protective treatment (including spraying, injection, &c.), and the development of immunity by selection or other means.

ROEPKE (W.). **Verdere gegevens omtrent de Iepenziekte en de Iepenspintkever.** [Further data concerning the Elm disease and the Elm sap beetle.]—*Tijdschr. over Plantenziekten*, xxxvi, 9, pp. 232–237, 2 pl., 1930.

Details are given of the writer's field observations near Wageningen, Holland, on the transmission of the elm disease fungus (*Graphium ulmi*) by the large elm sap beetle (*Scolytus scolytus*), resulting in a full confirmation of Betrem's and Fransen's laboratory experiments [*R.A.M.*, ix, p. 350] and establishing the importance of this agency. At a recent meeting of German entomologists at Kiel, Dr. H. Prell stated that similar observations had been made at the Tharandt Forestry Institute (Saxony). In the light of the new data concerning the relation between attacks of the sap beetle and the elm disease, it is considered probable that reports of severe infestations of the former in 1911 indicate that the disease was present in Holland as early as that year.

Garbers (F.). **Der Stand des Ulmensterbens u. seine Erforschung.** [The position of the dying-off of Elms and its investigation.]—*Gartenwelt*, xxxiv, 41, pp. 563–564, 1930.

After a decline in virulence during 1929, the dying-off of elms caused by *Graphium ulmi* broke out with renewed severity in the Bremen district of Germany in 1930. The presence of the elm sap beetle [*Scolytus scolytus*], now suspected as an agent in the transmission of the disease [see preceding abstract], has not been observed in the district in question, nor could any trace of the rings produced by its feeding on young branches be detected, although some 2,000 trees have already been felled on account of infection. Experiments in the control of the fungus by the injection of chinosol into the trees are stated to be in progress at Dahlem, but at present the sole reliable means of avoiding the spread of infection is the complete destruction by burning of diseased trees. In the writer's opinion, legal measures should immediately be adopted to enforce this precaution, and all those interested are urged to press the matter with the proper authorities.

Schmarse (H.). **Das grosse Baumsterben in Braunschweig.** [The great dying-off of trees at Brunswick.]—*Gartenwelt*, xxxiv, 41, pp. 564–565, 3 figs., 1930.

Plane [*Platanus*], *Tilia tomentosa, Quercus rubra, Corylus colurna*, and *Fraxinus ornus* trees between 50 and 60 years old have been affected at Brunswick by an extensive dying-off, necessitating the removal of large numbers. Only a portion of the foliage developed, and in June the leaves suddenly turned yellow and wilted; finally the branches and even whole trees died. In *T. tomentosa* especially, the condition shows signs of persisting until the next season. Although the primary cause of the trouble is believed to be the abnormally cold winter of 1928–9, followed by an exceptionally hot and dry summer, the possibility of fungous infection, e.g. by the agent of the elm disease [*Graphium ulmi*: see preceding abstracts], is thought to be by no means excluded, particularly in the case of the lime trees.

Long (W. H.). **Some microscopic characters of the rot caused by Ganoderma curtisii.**—*Phytopath.*, xx, 9, p. 758, 1930.

Oak and other hardwood trees along the southern Atlantic coast and inland as far as Texas are liable to a white basal rot caused by *Ganoderma curtisii* [regarded by Van Overeem as a synonym of *G. lucidum*: *R.A.M.*, iv, p. 565]. A microscopic examination of the early stages of decay in live oak (*Quercus virginiana*) revealed the destruction of the middle lamellae of the vessels. The middle lamellae in the large medullary rays are also often dissolved and the walls of the ray cells stain yellowish to blue with chloriodide of zinc. Many of the ray cells and tracheids show delignification. The bordered pits of the tracheids are uniformly corroded into large, round holes which often coalesce, causing the rupture of the cell under strain. The tangential walls of both large and small medullary rays are much perforated, and in some of the large rays the cells are often destroyed. Many of

the vascular cavities are filled with hyaline hyphae, 2 μ or less in diameter, which also permeate the tracheids, medullary rays, and other elements in a longitudinal and transverse direction.

KOCHMAN (J.). **Studja biologiczne nad pasorzytem Wierzby Fusicladium saliciperdum (All. et Tub.) Lind.** [Biological studies on the Willow scab fungus *Fusicladium saliciperdum* (All. et Tub.) Lind.]—*Mém. Inst. Nat. Polonais d'Écon. Rur. à Puławy*, x, 2, pp. 555–573, 1 pl., 3 figs., 1929. [English summary. Received December, 1930.]

In giving a detailed account of willow scab (*Fusicladium saliciperdum*) [*R.A.M.*, ix, p. 500] in Poland, the author states that he found numerous mature perithecia of its perfect stage (*Venturia chlorospora*) on dead twigs on the ground, while on twigs remaining attached to the trees perithecia are formed much less abundantly; he also obtained perithecia on cut twigs which he kept over winter under conditions closely similar to natural outdoor wintering. Germination tests showed that the ascospores are endowed with much greater viability than the conidia: in twelve hours in a drop of water practically the whole of the former had germinated and produced hyphae five times the length of the spores, while comparatively few of the conidia had begun germinating in the same period of time.

A description is also given of the cultural characters of *F. saliciperdum* on various media, among which one composed of 1·8 per cent. (by weight) agar, 0·3 per cent. K_2HPO_4, 0·25 per cent. $MgSO_4$, 0·5 per cent. NH_4NO_3, 4 per cent. glucose, and extract of willow twigs and dry leaves, was found to be the most suitable. On this medium the conidia germinated within 12 hours and produced cultures which in a few days took on an olive-green, velvety appearance, with a darker centre. Conidia (in all respects similar to those formed in nature) were produced in abundance, each coni diophore abstricting from two to several conidia, while in nature only one conidium is usually formed from each conidiophore. The optimum temperature for growth was 20° C.; when transferred to a temperature of 30° the cultures continued to grow very slowly, but fresh inoculations did not develop at that temperature; the fungus also grew, although extremely slowly, at temperatures between 5° and −2°. The organism develops within a very wide range of hydrogen-ion concentrations, namely P_H 4·4 to 9, with an optimum at 6.

The author succeeded in obtaining the conidial stage in cultures from single ascospores, but failed to obtain mature perithecia in cultures raised from the *Fusicladium* conidia, though he observed the formation of bodies which may have been the immature perithecia [cf. ibid., viii, p. 615].

Artificial inoculation experiments indicated that the species *Salix alba*, *S. blanda*, and *S. babylonica* are particularly susceptible to scab, while *S. amygdalina*, *S. purpurea*, and *S. viminalis* and their varieties exhibited marked resistance under the conditions of the experiments. The disease can be best controlled by spraying the willows with 1 per cent. Bordeaux mixture.

A brief note is appended on *Physalospora miyabeana*, [ibid.,

viii, p. 274] and *Phoma intricans* Schwarz which were also found attacking willow plantations, either alone or in association with *F. saliciperdum*, and both of which behaved as parasites on this host.

BOYD (O. C.). **A bacterial disease of Tung-Oil tree.**—*Phytopath.*, xx, 9, pp. 756–758, 1 fig., 1930.

Tung-oil or wood-oil trees (*Aleurites fordii*) in southern Georgia were observed, in October, 1929, to be affected by a bacterial leaf spot causing considerable damage in a thickly planted nursery of one season's growth. The spots were of the angular type, sharply delimited by the veins, brown to black on the upper side and yellowish-brown on the lower surface, and surrounded by a slightly water soaked, faintly yellowish halo. The lesions may coalesce to form large areas of dead, brittle tissue, giving a ragged appearance to the leaf. The accompanying lesions on the petioles are long, brown, and extend into the cortex, while those on the bark are round to oblong, brown to black, and penetrate into the wood. Secondary spread of the disease appears to be effected by wind-blown rain and also through cultural operations. Immense numbers of bacteria occurred in the younger lesions while other organisms were almost wholly absent. In no case were trees of four years old and upwards appreciably injured by the leaf spot.

VAN VLOTEN (H.). **Aantasting van Pseudotsuga taxifolia Britton (Douglasspar) door Rhabdocline pseudotsugae Sydow en Chermes cooleyi Gillette.** [Infection of *Pseudotsuga taxifolia* Britton (Douglas Fir) by *Rhabdocline pseudotsugae* Sydow and *Chermes cooleyi* Gillette.]—*Nederl. Boschbouw-Tijdschr.*, iii, pp. 283–298, 2 pl., 1930. [German summary.]

During 1930 *Rhabdocline pseudotsugae* [*R.A.M.*, x, p. 3] was observed in several localities of Holland and Germany on Douglas firs (*Pseudotsuga taxifolia*). In 1928 *Chermes cooleyi* was found on the same host. Discussing the risks attending the importation of living plant material from foreign countries, as exemplified by the case in point and others, the writer expresses the opinion that both *R. pseudotsugae* and *C. cooleyi* were brought to Europe with plants from America. They probably spread to Holland and Germany from Scotland, whence large consignments of Douglas firs have been procured during recent years. The legislation recently introduced in Germany against the importation of conifers [ibid., ix, p. 816] is very intelligible in the light of recent events, but scarcely likely to be effective against the natural spread of *R. pseudotsugae*. Extreme care should be exercised in the importation of exotic plant material for Dutch forest nurseries, in which the trees, in present circumstances, should be raised from seed. In Holland it would appear that *R. pseudotsugae* infects the vars. *glauca* and *caesia* of *P. taxifolia* with greater virulence than *viridis*.

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SCHUPHAN (W.). **Verdächtige Krankheitserscheinungen an Jungkoniferenbeständen in Boskoop.** [Suspicious pathological manifestations in young conifer stands at Boskoop.]—*Gartenwelt*, xxxiv, 41, p. 564, 1930.

In September, 1930, the writer observed certain symptoms on four- to five-year old *Abies pinsapo glauca* and *A. nobilis glauca* at Boskoop (Holland), which were strongly suggestive of infection by *Rhabdocline pseudotsugae* [see preceding abstract], viz. sudden general defoliation preceded by a brownish discoloration of the needles. The same phenomenon was exhibited in a milder form by various species of *Picea*.

LONG (W. H.). **Polyporus dryadeus, a root parasite of White Fir.**—*Phytopath.*, xx, 8, pp. 758–759, 1930.

White firs (*Abies concolor*) in the Sandia Mountains, New Mexico, were found to be severely attacked by *Polyporus dryadeus*, previously recorded on oaks and *Tsuga heterophylla* [*R.A.M.*, ix, p. 749]. Many of the larger roots were dead and rotted, while a few of the smaller surface ones were still alive, though with dead tips; infection was progressing along the roots towards the base of the tree. Sporophores (some in a sporulating condition) were found attached to the collar in some of the larger trees. The weathered pileus is dark brown or nearly black with an irregularly fissured surface. The cat-claw-shaped, thick-walled setae are dark chestnut-brown, 25 to 30 μ long by 10 to 12 μ thick at the base (average 26 by 11·5 μ). The hyaline, obovate to globose spores range from 7·5 to 10 by 7 to 8·5 μ, average 8·25 by 7·25 μ.

DELFORGE (P.). **Le Chrysomyxa abietis (rouille des aiguilles de l'Epicéa).** [*Chrysomyxa abietis* (Spruce needle rust).]—*Bull. Soc. Centr. Forest. Belgique,* xxxvii, 9, pp. 419–423, 1930.

A very brief account is given of a severe outbreak of the spruce (*Picea excelsa*) needle rust (*Chrysomyxa abietis*) [*R.A.M.*, viii, p. 344] which occurred in 1929 in the neighbourhood of Neufchâteau, Belgium, and was still prevalent in young spruce plantations in the early months of 1930. In the author's opinion the severity of the outbreak was due to the relatively cold weather experienced at the beginning of the spring of 1929, which delayed the germination of the teleutospores. The subsequent sudden rise of temperature led to a profuse sporulation of the fungus coincident with the formation of the new needles, which are highly susceptible to infection by the sporidia.

PEARSON (R. S.). **Report of the Director of Forest Products Research for the period October, 1928, to 31st December, 1929.**—*Rept. Forest Products Res. Board for the period ended 31st December, 1929*, pp. 11–50, 11 pl., 4 figs., 5 graphs, 1930.

During the course of an investigation into the preservation of mine timber visits were made to various mines in England and it was found that the dry rot caused by *Merulius lacrymans* or *Poria* spp. is prevalent where the atmospheric humidity is high,

but the timber is not soakingly wet or the temperature above 75° F. Where the timber is appreciably wet, *Fomes annosus* is the chief cause of decay in softwoods and *Polystictus versicolor* in hardwoods, while where the timber is waterlogged *Armillaria mellea* damages both types of wood. In certain conditions the decay may progress so rapidly as to necessitate new timbering in six months.

When it had been ascertained that the decay in transit from Canada of Sitka spruce [*Picea sitchensis*] used for aeroplane timbers was chiefly due to *Trametes serialis* [*R.A.M.*, viii, p. 689; ix, p. 79] arrangements were made by the Air Ministry for the timber to be given before shipment an antiseptic brush treatment against infection during transport to England, special precautions being taken also against placing it in conditions favourable to decay. These investigations led to a widening of the scope of the work, and brittleness or 'brashness' in timber is now being studied from several different angles.

To ascertain whether *T. serialis* can live with cellulose as the only source of carbohydrate a medium consisting of a chemically pure cellulose prepared from Sitka spruce, together with the necessary nitrogenous and mineral constituents, was made up and inoculated with *T. serialis* and other fungi. All the organisms reputed to be cellulose destroyers grew well on this medium, thus demonstrating their ability to utilize pure cellulose as a source of energy. Similar work was carried out using the hemicellulose products from oak; moderately good growth took place on hemicellulose A, but on hemicellulose B growth was extremely poor, while the residue from these products was toxic.

Two series of laboratory tests of the toxic value of preservatives to fungi were carried out, in which ten weighed blocks of each of four species of wood were impregnated with six different concentrations of various antiseptics and exposed for four months to attack by *F. annosus*; they were then examined and re-weighed, and the loss in dry weight due to fungal action was determined. A comprehensive series of field tests of the value of various antiseptics is also in progress. The specimens are treated in different ways with the antiseptics, and with the untreated controls are then inserted in the ground as stakes; these are inspected periodically, and records made of their durability. Each antiseptic is employed in three ways, viz. heavy and light treatments in a pressure plant and immersion in an open tank. In order to take into account the varying factors of soil and climate, parallel tests are to be carried out in three other localities besides the Forest Products Research Laboratory at Princes Risborough. Ten samples of each species of wood are to be treated with each preservative, there being an equal number of untreated controls. Thus, using four species of wood, the combined total of the specimens concerned with the test of any one preservative at one of the localities selected will be 240. The woods employed are oak, beech, Scots pine [*Pinus sylvestris*], and Douglas fir [*Pseudosuga taxifolia*], representing, respectively, hardwoods and softwoods difficult and easy to treat.

The collection of type cultures of wood-destroying fungi in the laboratory at Princes Risborough contains 103 species belonging to

36 genera, and includes most of the important timber-destroying fungi found in Great Britain as well as many from America. In the course of the culture work it was found that *Poria vaporaria* and *P. vaillantii* gave identical cultures, from which it is concluded that they are the same and that the form differences on which their separation was based are due merely to variation in environmental conditions.

Particular attention was paid to the study of *Paxillus panuoides* [ibid., viii, p. 79] causing a brown rot of coniferous timber; this fungus was found to be capable of causing considerable losses in dry weight, apparently owing to the removal of cellulose.

LEBEDEFF (V. I.). Синева древесины и терпентинный промысел. [Blue stain of timber and the turpentine industry.]—*Труды Инст. Промышл. Изысканий.* [*Trans. Industrial Research Inst.*], Archangel, *1929*, Part 5, 60 pp., 14 figs., 12 graphs, 1929. [Received December, 1930.]

The investigation reported in this paper was started in 1925 for the chief purpose of determining the relationship, if any, of blue stain (*Ceratostomella* spp.) of coniferous timber in north Russia to the wounds made in the trunks of pine trees in tapping for turpentine and resin. The work was begun by establishing the influence of environmental conditions on the growth of the three species of *Ceratostomella*, namely, *C. piceae*, *C. pini*, and *C. coerulea*, which are stated to be the most prevalent in the region investigated, and on the development of the discoloration in timber. All three organisms were shown to be extremely resistant to cold, since their viability was not impaired by exposure (in pieces of wood) over winter to temperatures reaching below −40° C. for several days continuously and averaging −20° for over six weeks. As established by the method suggested by Fawcett [*R.A.M.*, i, p. 312] the cardinal temperature points in pure culture on wheat flour-agar were: minimum for growth 5° to 7° C. for *C. piceae*, 7° to 10° for *C. coerulea*, and 5° to 7° for *C. pini*; optimum 23° to 27°, 25° to 29°, and 20° to 25°, respectively; maximum 35° to 37°, 35° to 39°, and 29° to 30°, respectively; and lethal 37° to 55°, 39° to 50°, and 30° to 55°, respectively. It is pointed out, however, that, as in the case of the citrus tree parasites [loc. cit.], these temperatures varied with the length of the period of growth and with the age of the cultures, their general tendency being to shift to a lower level with each successive day after the first. The temperature-growth curves and temperature coefficients which were worked out for the three species, show general lines of agreement with those obtained by Fawcett for the fungi parasitic on citrus. The time needed for the first appearance of pigmentation of the substratum in pure cultures also varied with the different species and temperatures; the shortest was noted in *C. coerulea* (2 days at 23° to 32° C.), followed by that in *C. pini* (4 to 5 days at 25° to 15°), but in *C. piceae* no discoloration of the substratum was apparent after five days at any of the temperatures tested. A further series of tests showed that none of the three species is capable of developing in wood with a moisture content below 18 or above 65 per cent.; the optimum moisture content for mycelial

but the timber is not soakingly wet or the temperature above 75° F. Where the timber is appreciably wet, *Fomes annosus* is the chief cause of decay in softwoods and *Polystictus versicolor* in hardwoods, while where the timber is waterlogged *Armillaria mellea* damages both types of wood. In certain conditions the decay may progress so rapidly as to necessitate new timbering in six months.

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The investigation reported in this paper was started in 1925 for the chief purpose of determining the relationship, if any, of blue stain (*Ceratostomella* spp.) of coniferous timber in north Russia to the wounds made in the trunks of pine trees in tapping for turpentine and resin. The work was begun by establishing the influence of environmental conditions on the growth of the three species of *Ceratostomella*, namely, *C. piceae*, *C. pini*, and *C. coerulea*, which are stated to be the most prevalent in the region investigated, and on the development of the discoloration in timber. All three organisms were shown to be extremely resistant to cold, since their viability was not impaired by exposure (in pieces of wood) over winter to temperatures reaching below —40° C. for several days continuously and averaging —20° for over six weeks. As established by the method suggested by Fawcett [*R.A.M.*, i, p. 312] the cardinal temperature points in pure culture on wheat flour-agar were: minimum for growth 5° to 7° C. for *C. piceae*, 7° to 10° for *C. coerulea*, and 5° to 7° for *C. pini*; optimum 23° to 27°, 25° to 29°, and 20° to 25°, respectively; maximum 35° to 37°, 35° to 39°, and 29° to 30°, respectively; and lethal 37° to 55°, 39° to 50°, and 30° to 55°, respectively. It is pointed out, however, that, as in the case of the citrus tree parasites [loc. cit.], these temperatures varied with the length of the period of growth and with the age of the cultures, their general tendency being to shift to a lower level with each successive day after the first. The temperature-growth curves and temperature coefficients which were worked out for the three species, show general lines of agreement with those obtained by Fawcett for the fungi parasitic on citrus. The time needed for the first appearance of pigmentation of the substratum in pure cultures also varied with the different species and temperatures; the shortest was noted in *C. coerulea* (2 days at 23° to 32° C.), followed by that in *C. pini* (4 to 5 days at 25° to 15°), but in *C. piceae* no discoloration of the substratum was apparent after five days at any of the temperatures tested. A further series of tests showed that none of the three species is capable of developing in wood with a moisture content below 18 or above 65 per cent.; the optimum moisture content for mycelial

growth was found to range between 30 and 45, and that for conidial production between 55 and 60 per cent.

Observations in the local conifer forests showed that living *Pinus* and *Picea* trees may be infected with any one or all of the species of *Ceratostomella,* which are always present in abundance, through accidental or tapping wounds. The balance of evidence indicated that the fungi establish themselves on denuded sap wood, on which they first grow superficially, as they are prevented from penetrating the underlying wood by its excessive moisture content; as the wood dries, the mycelium grows inwards through the intercellular spaces and the medullary rays, and then apparently acquires a semi-parasitic nature, as it seems to be capable of killing new areas of wood in advance of its penetration. In cases of extensive infection, the fungi appear to exert a debilitating effect on the trees, which may lead to a considerable reduction in, or even complete suppression of, the outflow of resin in tapped pine trees. In vigorous pines, the danger of infection through carefully made tapping wounds is rendered negligible by the fact that such wounds are almost immediately copiously overflown with resin which forms an effective barrier against the entry of the fungi; it is only where tapping is made with blunt instruments, leaving a ragged surface, that infection becomes possible. In *Picea* trees, however, any description of wound, whether ragged or smooth, is dangerous, since resin is exuded much more sparingly and never covers the whole of the wound.

Nigeria. Regulations No. 27 of 1930 made under the Agriculture Ordinance (No. 4 of 1926).—2 pp., 1930.

The Agriculture (Witch broom disease of Cacao) Regulations, 1930, effective as from 15th October, 1930, prescribe the conditions governing the importation of cacao plants, or parts thereof into Nigeria and the Cameroons under British Mandate, with a view to the exclusion of the witches' broom disease (*Marasmius perniciosus*) [*R.A.M.*, ix, p. 752]. Permits must be obtained from the Director of Agriculture for the importation of pods, seeds, beans, or other parts of cacao plants; of cases, wrappings, and the like, used for the transport of such material (except the jute bags used for the export of commercial cacao from Nigeria and reimported for further use); and of cacao leaves employed for packing other articles. In the case of cacao plants or parts thereof such permits will only be granted where the consignments are accompanied by duly authenticated certificates of freedom from disease and absence of contact with diseased plants or soil, or in other special circumstances rendering a permit desirable. Pods, seeds, or beans of cacao must, except in special circumstances, be accompanied by a certificate of freedom from disease and an assurance that they have been properly disinfected.

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GÄUMANN (E.). **Über eine neue Krankheit der Douglasien.** [On a new disease of Douglas Firs.]—Reprinted from *Schweiz. Zeitschr. für Forstwesen, 1930,* 5 pp., 1 pl., 1930.

Following brief notes on the symptoms and distribution of two fungous diseases of the Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*], viz., *Phomopsis pseudotsugae* and *Rhabdocline pseudotsugae* [*R.A.M.*, x, p. 141], not yet known to occur in Switzerland, the author gives details of the infection of this host in the Canton of Berne by a species of *Adelopus* (possibly *A. balsamicola*) [*R.A.M.*, ix, p. 617].

TROSCHANIN (P. G.). Исследование зараженности Сосновых насаждений Опытного Лесничества Татреспублики пузырчатой ржавчиной —„ серянкой "—**Peridermium pini f. corticola** (Предварительное сообщение). [Investigation of the degree of infection of the Pine plantations in the Experimental Forestry Circuit of the Tatar Republic with blister rust (seryanka), *Peridermium pini* f. *corticola*. (Preliminary communication).]—*Лесная Опытная Станция „ Татарстан "* [*Exper. Forestry Stat. 'Tatarstan'*] *Bull.* 2, Kazan, 25 pp., 2 figs., 1 map, 1929. [German summary. Received December, 1930.]

The preliminary investigation in 1928–9 of the experimental forestry circuit (about 3,000 ha. in extent on the left bank of the river Volga) of the Tatar Republic showed the widespread presence there of blister rust (*Peridermium pini* f. *corticola*) [*R.A.M.*, ix, p. 691] in the various types of pine plantations [the species of which is not indicated]. The incidence of the disease was found to be highest (53 per cent.) in plots from 81 to 100 years old, and on trees between the ages of 11 and 30 years within the plots. The earliest infection traced dated as far back as 58 years ago, and the maximum infection appears to have occurred about 1911. Since sources of infection are always existent, the variability in the severity of attack from year to year is believed to be probably due to variations in the number of spores of the fungus produced each year in dependence on seasonal conditions. The fact that the incidence of the disease was observed

to decrease from the outer borders of the plots inwards is considered to indicate that infection of healthy trees is promoted by careless felling operations, when trees from neighbouring plots are cut down so as to injure the pines standing on the border of the contiguous plot. There was also evidence that blister rust predisposes the pines to attacks by injurious insects, and that it considerably reduces by its own effects the commercial value of the pine timber.

It is believed that the disease spreads mainly by infection with spores from tree to tree, since the alternate hosts of the rust, namely, *Vincetoxicum officinale*, *Senecio vernalis*, and *Pedicularis commosa*, only occur sporadically and in limited stations far apart from one another.

COLLEY (R. H.) & RUMBOLD (CAROLINE T.). **Relation between moisture content of wood and blue stain in Loblolly Pine.**—*Journ. Agric. Res.*, xli, 5, pp. 389–399, 2 pl., 1 fig., 2 graphs, 1930.

The accurately controlled tests described in some detail in this paper were made for the purpose of determining the relation of moisture content of the sapwood of loblolly pine (*Pinus taeda*) to the development on it of blue stain caused by a strain of *Ceratostomella pilifera* [*R.A.M.*, x, p. 143], previously isolated by the authors from the same species. The results indicated that a moisture content of 24 per cent. on the oven-dry basis (equivalent to 19·3 per cent. on the wet wood basis) does not allow of a sufficient growth of the organism tested to produce staining of the wood. Although this point cannot be considered as an absolutely fixed limit below which blue stain does not occur, it may be assumed that the lower limiting value is somewhere near it. Allowing for the possible effect of the difference in the species of wood and in the strain of fungus used, this result agrees well with that obtained in 1907 by Münch, who found that 28 per cent. moisture was the lower limit for the development of blue stain caused by *C. coerulea* in *P. sylvestris* wood in Europe.

These experiments, coupled with field observations in the southern North American pine belt, suggest that blue stain fungi are not likely to develop in timber whose outside layers of cells have a moisture content of 24 per cent. or less, provided the environmental relative humidity is low. There is some evidence, however, that different species of pine react differently in regard to the rapidity of development and severity of blue stain. Until these have been investigated it is best to consider 20 per cent. moisture content as the practical working limit in the control of the trouble.

GÄUMANN (E.). **Untersuchungen über den Einfluss der Fällungszeit auf die Eigenschaften des Fichten- und Tannenholzes.** [Investigations on the influence of the time of felling on the properties of Fir and Spruce wood.]—*Beih. Zeitschr. Schweiz. Forstvereins*, 6, 155 pp., 6 pl., 25 graphs, 1930.

This is a comprehensive account, accompanied by 57 tables, of the author's investigations (extending over a period of five years)

on the influence of the time of felling on the durability of fir and spruce wood under the climatic conditions of Zürich. Practically speaking, durability implies resistance to the attacks of wood-destroying fungi, four of which were used in the laboratory tests supplementing the field work, viz., *Merulius domesticus* [*M. lacrymans*: *R.A.M.*, viii, p. 292], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina*, and *Coniophora cerebella* [ibid., ix, pp. 78, 216, 422, *et passim*].

In stem sections left for a year covered by the bark, the highest degree of durability was exhibited by the September and October fellings, and the lowest by those of March to June. The incidence of decay was lower in decorticated stem sections than in those left covered by the bark, irrespective of whether they were allowed to lie on the soil or raised on a fir plank 15 cm. from the ground. Two fir baulks felled in June were found to be infected by *L. heteromorpha* and *Aleurodiscus* sp. [cf. ibid., vii, p. 687]. In the case of baulks dug into meadow land for two years, resistance was found to depend on the degree of maturity of the wood. In green wood the decay of the summer-felled sapwood baulks was three to five times as extensive as that of those felled from September to January, while the rotting of the summer heartwood was twice as severe as that of the autumn- and winter-felled wood. On the other hand, where the baulks were kept for a year under dry conditions or exposed to the weather in the open, the rotting of summer-felled sapwood was only about twice as extensive as that of the winter material, while with heartwood the difference was even less. The current view as to the superior durability of spruce in comparison with fir wood was upheld by the laboratory tests, but under field conditions the difference was without practical significance.

Laboratory experiments under controlled temperature and moisture conditions indicated that two factors are involved in the quality of durability, viz., the varying degree of resistance of the wood to fungous infection at different seasons, and the varying rate of fungous growth under divergent atmospheric conditions. All the fungi used in the tests were found to develop more profusely in the summer-felled wood.

The resistance of the wood to fungous infection is closely connected with the formation of annual rings. Fir and spruce trees should not be felled, for purposes in which resistance to fungi is of paramount importance, from the commencement of the circulation of the sap until the conclusion of annual ring formation, since the destructibility of the wood is greatest during the period of most active metabolism. The dates of these biological processes fluctuate according to the local and seasonal climatic conditions, and in trees of different kinds, so that the exact limits of the favourable and unfavourable felling periods cannot be specified. It appears certain, however, that November and December are the best months from the standpoint of internal durability of the wood, and May and June the worst. The superior durability of the wood during the former period is considered to be due primarily to rhythmical colloid-chemical variations in the dissolubility of the fibre substances (especially cellulose, though xylan and the lignins are also

involved to a lesser extent). Seasonal fluctuations in the cell content substances, e. g., carbohydrates, resins, nitrogen compounds, and mineral salts, are regarded as of secondary importance. The above-mentioned decline in the influence of the time of felling on the incidence of decay in wood stored under dry conditions or exposed to the weather for a year, is ascribed to a colloid-chemical 'ripening' process in the fibre substances, especially cellulose and xylan. A further result of a year's exposure of the wood to weathering was almost complete disappearance of the variations in resistance of the four different kinds of wood (fir and spruce, sapwood and heartwood) to the four fungi used in the tests. Thus the old tradition of employing weathered wood for bridges and other structural purposes rests on a sound basis. Generally speaking, moreover, the results of these investigations confirm the truth of the popular adage regarding the relative durability of winter- and summer-felled wood, but only in the green, and not in the dry stage.

[A condensed version of this paper appears in *Ber. Deutsch. Bot. Gesellsch.*, xlviii, 5, pp. 156–168, 6 graphs, 1930.]

FALCK (R.). **Der Lignin- und Cellulose-Abbau der Laub- und Nadelstreu durch Fadenpilze aus der Klasse der Basidiomyceten und seine Bedeutung für die Bildung der Humusstoffe des Waldbodens.** [Lignin and cellulose disintegration in fallen leaves of deciduous trees and conifers by Hyphomycetes of the Basidiomycete group and its significance in the formation of the humus substance of forest soil.]—*Cellulosechemie*, xi, 9, pp. 198–202, 1930.

Disintegration by *Agaricus nebularis* was found in the author's investigations [which are fully described and the results tabulated] to be of the so-called 'corrosion' type [cf. *R.A.M.*, ix, p. 150] both in deciduous (beech) leaves and in pine needles. Lignin and cellulose, together with the pentosans, were simultaneously consumed. In the needles, on which the fungus does not live in nature, the disintegration of lignin and cellulose was relatively slight (10·8 per cent. of the total), whereas in beech leaves, its natural habitat, up to 60 per cent. of the dry substance and up to 80 per cent. of the lignin and cellulose were destroyed. *A. nebularis* was found to be a pronounced lignin-consumer in beech leaves, reducing its amount to less than that of cellulose and pentosans at practically every stage of disintegration.

In contrast to *A. nebularis*, *Coniophora cerebella* [see preceding abstract] produces disintegration of the 'destruction' type, the cellulose being exclusively assimilated while the lignin remains intact. The carbohydrate content of the residue left by *C. cerebella* decreases in proportion to the accumulation of lignin, so that the end-product is virtually immune from further disintegration by fungi and the like, and remains in the form of raw humus. This process (the exact opposite to that involved in disintegration by *A. nebularis*) is termed by the author 'hyphomycetous humigenia'. The amount of cellulose consumed in pine needles decomposed by *C. cerebella* was 55 per cent., or more than three times the quantity assimilated by *A. nebularis*. On the other hand, *C. cerebella* only

consumed 12 to 14 per cent. of the cellulose content of the beech leaves, or about half the original content of 26 per cent., while the quantity assimilated by *A. nebularis* ranged from 9 to 19 per cent.

The wood-disintegrating fungi may be classified, on the basis of the above data, into two groups, namely, the lignin-preserving humus-producers and the lignin-disintegrating humus-destroyers. Since the accumulation of acid humus tends to favour the development of disease in forest soils, this process should be counteracted as far as possible by biological means.

CAMPBELL (W. G.). **The chemistry of the white rots of wood. I. The effect on wood substance of Polystictus versicolor (Linn.) Fr.**—*Biochem. Journ.*, xxiv, 4, pp. 1235–1243, 1930.

Chemical analyses [the results of which are tabulated and discussed] of beech and ash wood attacked by *Polystictus versicolor* [*R.A.M.*, ix, p. 216] showed that this type of decay is marked by the following features. The rotted wood becomes more soluble in water. In the early stages of decay the residue is slightly more soluble in alkali than the original wood, but this tendency decreases as the rot advances. The pentosans and lignin are the first components to be attacked, and of these the pentosans not in the cellulose suffer the heaviest depletion. With the advance of decay the rate of pentosan depletion is diminished, preferential attack being made on the cellulose proper as well as on the lignin.

It is concluded that the rot of beech and ash wood caused by *P. versicolor* is of the 'white' as opposed to the 'brown' type [ibid., ix, p. 79].

The effects of the decay on wood substance are regarded as closely comparable to those produced by acid-alcohol solutions under certain conditions. The theory is advanced that the fungus secretes an oxidase which acts upon lignin and pentosans to produce acid. The further simultaneous action of oxidase and acid completes the process of decomposition involving the depletion of the cellulose proper.

CURZI (M.). **Intorno alle tracheomicosi e a nuovi gravi casi di verticilliosi.** [On tracheomycoses and new grave cases of verticilliosis.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 1, pp. 44–62, 2 figs., 1930. [Received December, 1930.]

In continuation of the author's previous investigations [*R.A.M.*, v, p. 579] notes are given on new cases of *Verticillium* tracheomycosis or tracheoverticilliosis recently observed in Italy.

The fungus isolated by Pulselli from artichoke (*Cynara scolymus*) [ibid., viii, p. 84] was kept under observation in culture and the disease concerned was ascertained to be a tracheomycosis similar to those reported by Dufrénoy in 1927 [ibid., vii, p. 179; see also iv, p. 495] as due to a *Verticillium* with dark sclerotia and hyaline conidiophores.

Fatsia japonica when grown in the open in Italy is much subject to a disease of this type, which, owing to the slight nature of the symptoms produced, has not previously been reported. If affected plants are directly exposed to the sun in summer the

leaves often wilt and the death of the aerial parts ensues. Directly the weather permits new, somewhat rachitic, tufted shoots with slightly abnormal leaves develop at the base of the wilted branch. In one garden two plants have been affected for some years, and nearly every summer the apical shoots wilt, but are replaced by new shoots when the rainy season begins. This condition is regarded as different from that previously reported on *Aralia cordata* [ibid., iii, p. 440 and *A. racemosa* [ibid., vii, p. 752].

Over 40 per cent. of *Impatiens balsamina* plants in a large bed near Milan were affected by a wilt, as were others at Pisa and Genoa, the symptoms closely resembling those common in this condition on other herbaceous plants; rachitism or apoplexy was present, depending on the time of infection and the prevailing weather. This is stated to be the first record of the disease on Balsaminaceae.

The condition was also observed on a three-year-old apricot near Pavia [cf. ibid., vi, p. 238; vii, pp. 179, 300]; the tree was divided near the collar into two main branches, the leaves of one of which suddenly wilted at midsummer, as in a partial apoplexy. After the removal of the diseased branch the other became affected, and at the end of the summer the whole tree succumbed.

Two young, well-developed plum trees growing within a few metres of each other were also affected, one very severely. On this the branches were to a great extent defoliated and bore a few yellowish, drooping, flaccid leaves; the bark easily became detached, disclosing a discoloured cylinder. The second tree showed only slight symptoms, the leaves at the extremity of one branch on the side towards the other plum tree wilting, suggesting transmission by root contact; the trunk showed slight discoloration on the side bearing the affected branch, in some of the tracheids of which the mycelium of a *Verticillium* was present. Infection had originated during the previous summer on the more severely affected tree.

A young Burbank plum tree showed slight discoloration of the woody cylinder of a lateral root, a small area of infection extending on the corresponding side of the trunk up to one of the main branches. In the affected zone many of the vessels were full of gum, and some contained thin, septate, hyaline or yellowish hyphae.

In some localities tomatoes were widely attacked, the disease producing either a rapid wilt or a slow one accompanied by rachitism of the aerial organs and curling of the leaf blades. The disease was distinguishable from virus infestation by the fact that the leaves were dry and curved. Other tomato plants were affected by *Bacterium solanacearum*, but whereas in tracheomycosis the discoloration of the wood was restricted to the vessels, in the bacterial contamination it extended into the surrounding parenchymatous cells.

In all the cases described the author invariably isolated strains of *Verticillium* which could be referred to the group characterized by numerous, small, dark-olivaceous sclerotia and thin, hyaline conidiophores, comprising *V. dahliae* and *V. tracheiphilum*. A close affinity was observed in the anatomo-pathological characters and the symptoms of the disease in all the different hosts.

The paper concludes with a discussion of the physio-pathological characteristics of tracheoverticilliosis, and there is a bibliography of some 30 titles.

BACH (W. J.) & TAUBENHAUS (J. J.). **Black-rot of Cabbage and its control.**—*Texas Agric. Exper. Stat. Circ.* 57, 9 pp., 1 fig., 1930.

Heavy losses (up to 20 per cent. of the crop) were caused during 1928–9 in the lower Rio Grande Valley of South Texas by black rot of cabbage (*Bacterium campestre*) [*Pseudomonas campestris*: *R.A.M.*, vi, pp. 387, 590], which also attacks broccoli [ibid., viii, p. 213], cauliflower, turnips, and white radishes. Infection was most severe on the popular Glory of Enkhuizen and Copenhagen Market varieties of cabbage. Notes are given in popular terms on the symptoms, distribution, mode of transmission, and control of the disease by cultural practices and seed disinfection with corrosive sublimate.

COTTIER (W.). **Experiments on transmission of dry-rot (Phoma lingam) of Swedes by insects.**—*New Zealand Journ. of Agric.*, xli, 3, pp. 194–199, 2 figs., 1930.

This is a brief account of preliminary experiments at the Plant Research Station, Palmerston North, New Zealand, the results of which showed that dry rot (*Phoma lingam*) [*R.A.M.*, ix, pp. 150, 218] was in a few cases transmitted to healthy swedes by a Staphylinid beetle and a Drosophilid fly previously kept for some time in contact with dry rotted roots. Although the percentage of successful transmission was admittedly low, the fact that none of the controls kept under identical conditions showed any sign of the disease tends to incriminate both insects (which are very common in New Zealand in dry rot lesions on swedes) as possible carriers of the infection. Further experiments to elucidate this question are in progress under conditions as nearly natural as possible.

KOVAČEVSKI (I. C.). Болеститѣ по Фасула въ България. [French Bean diseases in Bulgaria.]—46 pp., 8 figs., Държавна Печатница [Government Printing Office], Sofia, 1930. [English summary.]

This is a semi-popular account of the chief diseases which attack French beans [*Phaseolus vulgaris*] in Bulgaria, where the crop is extensively cultivated. The two most important of these diseases are bacterial blight (*Phytomonas* [*Bacterium*] *phaseoli*) and bacterial wilt (*P.* [*Bact.*] *flaccumfaciens*) [*R.A.M.*, x, p. 6], a full description of which, as they occur in Bulgaria, has already been given by the author in a previous paper [ibid., ix, p. 151]. The other diseases dealt with are a widely distributed dry root rot, apparently caused by an undetermined species of *Fusarium* and closely resembling that caused by *F. martii* var. *phaseoli* [ibid., viii, p. 628] in the United States; anthracnose (*Colletotrichum lindemuthianum*) [ibid., viii, p. 349]; mosaic [ibid., ix, p. 423];

rust (*Uromyces appendiculatus*) [ibid., vii, p. 531]; sun scald; and damping-off caused by various soil-inhabiting fungi, among which species of *Fusarium* are predominant. The last three of these diseases are stated to be of minor importance. A key is appended for the identification of the diseases by the microscopical symptoms on the various organs of the host.

NEUWIRTH (F.). **Microsphaera betae Vaňha.**—*Zeitschr. für Zuckerind.*, Prague, lv, 7, pp. 75–79, 3 figs., 1 graph, 1930.

An account is given of the writer's investigations on the mildew of beets caused by *Microsphaera betae* Vaňha [*R.A.M.*, viii, p. 152], the presence of which in Czecho-Slovakia (principally in glass-houses) has now been demonstrated. The same disease is stated to have been also observed at Bonn (Rhine) in 1928.

The fungus forms a greyish-white mycelium on both leaf surfaces. The conidia, abstricted from the tips of simple conidiophores, are ellipsoid to cylindrical and mostly 47·7 by 14·2 μ in diameter (200 measurements). Perithecia are sometimes formed on the leaves towards the end of the summer.

Some suggestions are made for the control of the fungus by spraying with Bordeaux mixture (3 per cent.), sulikoll [*R.A.M.*, viii, pp. 289, 609], or a similar preparation. According to Klika (Monograph of Bohemian Mildew Fungi, 1924) *M. betae* was controlled at Hamburg by sulphur vaporization at a temperature of 448° C., the amount of sulphur required for this purpose being 1 kg. per hect. [A Czecho-Slovakian version of this paper appears in *Ochrana Rostlin*, x, 4–5, pp. 119–127, 2 figs., 1 graph, 1930.]

RAMBOUSEK (F.) & NEUWIRTH (F.). **Gewebsrisse im parenchymatischen Grundgewebe und die nachfolgende Fäulnis der Zuckerrübe.** [Tissue cracks in the parenchymatous fundamental tissue and subsequent decay of the Sugar Beet.]—*Zeitschr. für Zuckerind.*, Prague, lv, 6, pp. 53–60, 4 figs., 2 graphs, 1930.

Sugar beets in two districts of Czecho-Slovakia were attacked in 1929 by a disease hitherto unknown in that country but previously observed by the senior author in Italy and Rumania, where it caused exceedingly heavy losses.

The first symptom is a sudden wilting and yellowing of the oldest leaves which gradually extends to the younger ones and ultimately reaches the heart. Longitudinal sections through the roots of affected plants showed that the parenchyma between the rings of the vascular bundles was torn to shreds, while fissures also occurred in the interior of the root. Decay sets in, spreading from the tip of the root upwards. In some cases callus formation was observed in the fissures. Three organisms were found to be associated with the rotting, viz., *Penicillium* sp., *Oospora* sp., and *Acrostalagmus* sp. (allied to *A. albus*) [*R.A.M.*, viii, p. 641], but the primary cause of the disease is believed to lie in abnormal weather conditions during the growing period (high temperatures and low rainfall), possibly coupled with the effect of impermeable soils having a high lime content.

HIURA (M.). **Studies on some downy mildews of agricultural plants. IV. On the downy mildew of Welsh Onion (Report II).**—*Agric. & Hort.*, v, 8, pp. 1008–1014, 1930. [Japanese, with English summary.]

Further investigations made in Japan into downy mildew of Welsh onions [*Allium fistulosum*] due to *Peronospora schleideni* [*R.A.M.*, x, p. 7] showed that conidial production was abundant between 13° and 18° C., appreciably decreased at 10° and 20°, and ceased below 6° or above 25°; the optimum temperature for their formation appeared to lie near 15°. Germination took place in 5 to 7 hours at 5°, in 2 to 3½ hours at 10°, in 1½ to 3 hours at 15°, in 2 to 3 hours at 20°, and in 2½ to 3½ hours at 25°. The optimum temperature for germination appeared to be near 10°, the maximum was about 28°, and the minimum below 5°. Some of the conidia lived for a week under dry conditions in the laboratory, but others retained their vitality for only 2 to 3 days.

Inoculation experiments indicated that *P. schleideni* from the Welsh onion can infect *Allium fistulosum* var. *caespitosum* and common onions, but not the other species of *Allium* tested, which strongly suggests that different forms of the fungus may exist.

TAVEL (CATHERINE V.). **Zur Systematik und Biologie der Allium bewohnenden Uredineen. (Vorläufige Mitteilung.)** [On the systematic position and biology of the Uredineae occurring on *Allium*. (Preliminary note.)]—Reprinted from *Mitt. Naturforsch. Gesellsch. Bern, 1930*, 2 pp., 1930.

No constant differences were found by the author between the three autoecious Uredineae occurring on *Allium* spp., known as *Puccinia allii*, *P. porri* [*R.A.M.*, ix, p. 82], and *Uromyces ambiguus*, as regards the presence of paraphyses, the number of germ pores in the uredospores. and the ratio of uni- to bicellular teleutospores. Further investigations on the dimensions of the teleutospores are necessary to determine whether this character can be used to separate the three species. *A. flavum* and *A. fistulosum* were infected in cross-inoculation experiments by *P. allii* from *A. sphaerocephalum* and *A. carinatum*, by *P. porri* from *A. schoenoprasum* and *A. pulchellum*, and by *U. ambiguus* from *A. schoenoprasum*, and may therefore be considered as collective hosts for all three species.

MONTSERIN (B. G.). **A Fusarium disease of the Cucumber fruit.**—*Proc. Canadian Phytopath. Soc., 1929*, pp. 29–31, 1 pl., 1930.

In June, 1929, an apparently hitherto undescribed disease of cucumber fruits occurred in the greenhouse of the Horticultural Experiment Station, Vineland, Ontario. Infection was very severe on the susceptible smooth-skinned varieties, causing losses of over 40 per cent. of the marketable produce.

The first conspicuous symptom is a slightly discoloured area on the young fruit which presents a water soaked aspect. An irregular, slightly sunken, olive-green lesion develops, the surface of which is covered with droplets of a gummy exudate often coalescing into prominent translucent globules; later these turn

amber-coloured and become solid, persisting on the lesion as a film. As the fruit enlarges the film of gum cracks irregularly, and the resulting meshwork of fissures gives a scabby appearance to the fruit. The lesions often extend more than three-quarters the length of the fruit on one side, and the ripe cucumber is invariably curved and distorted owing to the restricted growth round the lesion and the more or less normal development of the unaffected part.

A species of *Fusarium*, provisionally assigned to the section *Ventricosum*, was constantly isolated from the diseased cucumbers. Inoculation experiments with pure cultures of this fungus gave positive results, the organism being reisolated from the artificially induced lesions. The fungus was found to be a wound parasite, entering the fruit through abrasions made by contact with the leaves, stems, or trellis wires. The disease is favoured by high temperature and high humidity.

The outbreak of the *Fusarium* disease occurred on plants with which hybridization studies were being conducted. The English Forcer, a smooth-skinned variety, was crossed with a rough-skinned one. Both the smooth-skinned parent and the smooth-skinned F_2 offspring were very susceptible, especially the latter. On the other hand, the rough-skinned F_2 offspring exhibited resistance or immunity in a similar manner to the rough-skinned parent. The three outermost layers of the cortex in the rough-skinned variety were found to be composed of sclerenchymatous tissue in contrast to the thin-walled parenchyma of the susceptible varieties, and this may have some bearing on their relative resistance and susceptibility.

The incidence of infection was reduced to a minimum by lowering the temperature and atmospheric humidity of the greenhouse.

RAVAZ (L.). **Chronique. Toujours le mildiou.** [Current events. Mildew still.]—*Prog. Agric. et Vitic.*, xciv, 31, pp. 101–105, 1930.

In this paper the author continues his short periodical notes on the seasonal development of vine mildew [*Plasmopara viticola*: *R.A.M.*, x, p. 9] during the past summer in southern France, and, writing in August, again stresses the necessity of further applications of Bordeaux mixture spray at intervals of four or five days, in view of the persistent wet and warm weather which presents a serious threat to the new grape crop.

CADORET (A.). **Le mildiou en 1930.** [Mildew in 1930.]—*Prog. Agric. et Vitic.*, xciv, 35, pp. 211–212, 1930.

After mentioning the very considerable damage done to vineyards in the south of France in 1930 by mildew [*Plasmopara viticola*], the author states that an extensive investigation of the stricken regions led him to the conclusion that in many cases the failure of the sprays to check the disease is attributable to a defective preparation of the vines to receive the treatments. The best results of the sprays were found to have been obtained on stocks with a weak vegetation and with well-exposed grapes, and on stocks

which had been pruned just previous to blossoming and before the application of the sprays, so as to expose the grapes to the action of the fungicide. There was also evidence of the influence of the rootstock on the susceptibility of the vines, since those grafted on Berlandieri and Riparia appeared to have suffered least. Good control was also obtained in well-ventilated vineyards with an orientation from north to south.

RAVAZ (L.). **Chronique. Le rognage contre le mildiou.** [Pruning for the control of mildew.]—*Prog. Agric. et Vitic.*, xciv, 36, pp. 221–224, 1930.

In this note the author briefly discusses the causes of the reported successes and failures in improving the control of vine mildew [*Plasmopara viticola*] in sprayed plants by means of cutting off during vegetation the apical portions of vine shoots, a procedure which is steadily gaining ground in the south of France and elsewhere. In advancing some hypotheses to explain the contradictory results obtained, with special reference to the successful ones, he believes that the pruning of the excessive green parts may lead to a better nutrition of the remaining organs, and thus heighten the resistance of the plant to the disease; this view is supported by a reference to Schaffnit's and Volk's recent paper on the influence of nutrition on the susceptibility of plants to parasites [*R.A.M.*, ix, p. 472].

SOURSAC (L.). **Le mildiou. Observations sur la perpétuation de la maladie d'une année à l'autre et sur sa dissémination.** [Mildew. Observations on the carrying over of the disease from one year to the next and on its spread.]—*Prog. Agric. et Vitic.*, xciv, 33, pp. 157–159, 1930.

The author states that observations of vine growers in the Pyrénées-Orientales showed that in 1930, which was preceded by a very rainy winter and was marked by early and heavy outbreaks of mildew [*Plasmopara viticola*], well-tilled vineyards situated on hilly slopes on comparatively dry soil suffered more from the disease than vineyards in the plains which were flooded by torrential rainstorms and the soil of which could not, therefore, be as well cultivated as that of the former. In his opinion, the explanation of this phenomenon is that the crust formed on the soil in consequence of waterlogging hindered the normal germination of the oospores of the fungus contained in the soil, and checked infection of the vines from this source. A confirmation of this view is found in the observation frequently made in seasons with a wet spring, especially in 1930, that the first important outbreaks of mildew follow very closely on the ploughing or hoeing of the soil in the vineyards. He believes that these observations indicate that winter cultivation and manuring of the vineyards should be terminated as early in the season as possible, so as to leave the soil surface unbroken in the spring when temperature and humidity conditions become favourable for the germination of the oospores of *P. viticola*. For the same reason subsequent cultivation of vineyards should be avoided during periods favouring

the development of mildew, and if the removal of weeds appears imperative it should be done with a garden rake.

ARMET (H.). **Action coagulante du cuivre sur le mildiou.** [Coagulating action of copper on mildew.]—*Prog. Agric. et Vitic.*, xciv, 32, pp. 137–140, 1930.

After briefly reviewing the theories advanced by M. and Mme Villedieu [*R.A.M.*, iv, p. 297, and next abstract] on the one hand, and by Chaine [ibid., viii, p. 659] on the other, to explain the fungicidal action of Bordeaux and Burgundy mixtures on the spores of vine mildew (*Plasmopara viticola*), the author suggests that the action of the copper in the mixtures is more complex than envisaged by either of these previous investigators, and may be due to both a plasmolytic and a contact effect, the latter of which brings about the coagulation of the protoplasm of the germinating spores. This view is mainly based on the fact that, while ordinary plasmolysis, followed by the death of the cells, causes a collapse of the cytoplasm, the Villedieus observed a certain swelling of the contents of the conidia and zoospores of *P. viticola* killed by copper, this suggesting a colloidal coagulating effect of the copper on the cytoplasm of the spores, similar to that exerted by tannin on gelatine, isinglass, albumin, and other colloids. If this be true, copper in its soluble or insoluble cupric form is a specific coagulating agent for the proteid and albuminoid substances which enter into the composition of the cytoplasm of the spores of *P. viticola*, and its protective action against invasion of the host tissues by the parasite is attributable to this character.

VILLEDIEU (G.). **Cuivre et mildiou.** [Copper and mildew.]—*Prog. Agric. et Vitic.*, xciv, 42, pp. 373–376, 1930.

In this note the author refers to experiments [no further details of which are given] in which appropriate chemical combinations of copper were introduced into vine stocks in the attempt to immunize them against mildew [*Plasmopara viticola*]. At the start of the season's vegetation the stocks thus treated (the sap of which was shown to contain copper) developed a much more vigorous foliage than that of the untreated checks, but the treatment appeared to enhance their susceptibility to mildew, which later in the season attacked and killed practically every leaf on them. This result is considered to support the view previously stated by him and Mme Villedieu that copper is not in itself a specific poison for *P. viticola*, and that its fungicidal action is only dependent on the chemical form in which it comes into contact with the parasite [see preceding abstract].

He further states that his observations lead him to the conclusion that excessive nitrogenous fertilization, particularly with ammonium nitrate, predisposes the vine to the disease.

RIVES (L.). **Essais de sulfatages aux héliones.** [Spraying tests with chemical dyes.]—*Rev. de Vitic.*, lxxiii, 1891, pp. 230–231, 1930.

To test the curative value in cases of downy mildew and *Oidium* of the vine [*Plasmopara viticola* and *Uncinula necator*] of the

chemical dyes or 'héliones' recently suggested for use against plant diseases in France [*R.A.M.*, ix, pp. 326, 327], two otherwise untreated rows of *Vitis vinifera* were very carefully sprayed with the yellow and orange dyes supplied by Truffaut, one application being made on 4th July, 1930, when the leaves and fruit clusters showed the presence of *P. viticola*, and a second on 29th July. No control was obtained, both diseases developing intensely. Morteville vines which received two applications of the dyes in addition to the routine copper sulphate treatment showed no improvement as compared with others given the latter only; the dyes also failed to control anthracnose [*Gloeosporium ampelophagum*] on Malègue 829-6. The conidia and conidiophores of *P. viticola* and the conidia and ectophytic mycelium of *U. necator* when reached by the dyes were immediately stained and destroyed, but no adequate covering was secured of the fruit clusters and under surface of the leaves.

That the dyes do not destroy the endophytic mycelium of *P. viticola* was demonstrated by the fact that when infected leaves on which all the conidia had been stained and destroyed a week previously were placed in a damp chamber new conidia rapidly developed. The same was also observed with leaves affected with grey rot [*Botrytis cinerea*].

LIBUTTI (D.). **La Peronospora dei grappoli e il marciume bianco degli acini d'Uva.** [*Peronospora* of the fruit clusters and white rot of Grape berries.]—*L'Istria Agric.*, N.S., x, 14, pp. 331–334, 1930.

Heavy rains in July, 1930, were followed by severe outbreaks in many localities in Italy, including Istria, of downy mildew [*Plasmopara viticola*: *R.A.M.*, viii, p. 699; ix, p. 762] and white rot (*Coniothyrium diplodiella*) [see next abstract] of the vine, the symptoms of which are briefly described and differentiated.

To control *P. viticola*, in addition to very carefully prepared Bordeaux mixture, the use of 3 per cent. cupric sulphur dust, or better, plain sulphur mixed with 15 to 20 per cent. Caffaro powder, is recommended. Berries attacked by *C. diplodiella* should be promptly destroyed, while the usual preventive measures should be supplemented by sprays containing at least 2 per cent. copper sulphate or Caffaro powder; the vines should also be dusted with sulphur mixed with 30 to 50 per cent. Caffaro powder.

OSTERWALDER (A.). **Starkes Auftreten der Weissfäule.** [Severe outbreak of white rot.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 17, pp. 339–340, 1930.

Attention is drawn to a recent severe outbreak of white rot (*Coniothyrium diplodiella*) [*R.A.M.*, x, p. 10, and preceding abstract] affecting Riesling-Sylvaner, Räuschling, and Clävner vines near Stäfa [Lake of Zürich]. The disease is a frequent concomitant of the hailstorms prevalent during July and August. It is impossible to combat this fungus, which enters the grapes through fissures and develops within the tissues. A serious consideration in connexion with the above-mentioned epidemic is the infestation of

the soil by the fungus from the rotted grapes which readily fall from the branches.

RAVAZ (L.). **Essais de traitement du court-noué.** [Experiments in the control of 'court-noué'.]—*Ann. École Nat. d'Agric. Montpellier*, N.S., xx, 3, pp. 213–218, 3 figs., 1930.

This is a brief summary of the experiments which were conducted to find an effective method for the prevention and control of the 'court-noué' disease of the vine, the results of which were reported in a previous paper [*R.A.M.*, viii, p. 13].

[This paper is reproduced in *Prog. Agric. et Vitic.*, xciv, 39, pp. 293–297, 1930.]

MENCACCI (M.). **Sopra due nuove alterazioni della Vite.** [On two new affections of the Vine.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 1, pp. 108–113, 1 pl., 1 fig., 1930. [Received December, 1930.]

A description is given of two previously unrecorded diseased conditions of the vine observed by the author during the summer of 1929 in the vicinity of Rome.

In one case the young shoots developed a sort of rachitism resembling 'roncet' or leaf curl [*R.A.M.*, vii, p. 556]; the first leaves put out by the vine were whitish and became thickly covered with hairs. They remained stunted, were much deformed, and sometimes the under surfaces were rugose or bullate. The most striking symptom, however, was the formation on the under surfaces of the stunted leaves of one or more pairs of small parallel leaf blades [enations] close together, which arose in continuation of the normal tissues, later folding back flat. Sections of these showed a perfectly normal structure. The leaves which formed later in the season were seldom rugose, and were larger and less contracted; those developing at the end of May and in June were normal.

The vines shed the diseased leaves and often put out new shoots from the adventitious buds and the old wood. As the shoots put out successively were not much affected, the vine appeared gradually to become almost normal. Flowering was delayed 10 to 15 days and growth was not complete until August, instead of June. Often the fruit clusters were abortive, or only a few berries were produced.

The other, and much more serious, condition was characterized by a curling up of the extremities of some of the branches, which were punctured and knotted, after flowering. The small terminal leaves ceased to grow and became contracted, while little or no fruit was produced.

No fungus or bacterium was associated with the conditions, both of which are attributed to insect attack.

[WORMALD (H.).] **Plant pathology. Mycology and bacteriology.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1929, to 31st December, 1929*, pp. 67–71, 1930.

Further inoculations of Fertility pear flowers at East Malling Research Station, Kent, with a strain of *Sclerotinia cinerea*

obtained from cherry again produced typical blossom wilt, these experiments, together with those conducted in 1928 [*R.A.M.*, viii, p. 546], proving conclusively that *S. cinerea* f. *pruni* as found on plums and cherries can cause a blossom wilt of pears.

Continued observation on Cox's Orange Pippin apples confirmed the view [loc. cit.; ibid., x, p. 37] that the nature of the stock to some extent affects the susceptibility of the scion variety to apple scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*]. The following data were those obtained most consistently: Cox's Orange Pippin is more susceptible (*a*) to scab on the twigs when worked on Malling nos. I, IX, IV, XVI, respectively, than on nos. XV, XIII, and III, respectively; (*b*) to scab on the leaves when on nos. I, V, IX, than on nos. XV, XIII, IV; (*c*) to scab on the fruit when on nos. IX or I than on XIII. The same variety is more susceptible to mildew on the twigs when worked on nos. I, II, and X, respectively, than on nos. XV, IV, and XVI, respectively.

A serious disease of Bath's Perfection raspberries was caused by a fungus closely resembling the description of *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: see below, p. 164].

Russeted apples and blistered apple twigs again revealed the widespread distribution of *Coniothecium chomatosporum* [ibid., viii, p. 546].

BRAUN (K.). **Bericht über das Auftreten von Schädlingen und Krankheiten im Obst- und Gemüsebau usw. im Regierungsbezirk Stade während der Monate Januar bis Juni 1929.** [Report on the occurrence of fruit and vegetable pests and diseases in the administrative district of Stade during the months from January to June, 1929.]—Reprinted from *Altländer Zeit.*, Jork, 139, 143, 147, 151, 155, 1930.

The dying-off of heather (*Calluna vulgaris*) in various districts of North Germany [*R.A.M.*, viii, p. 689] cannot be definitely ascribed to the fungus [*Stemphylium ericoctonum*] previously suspected, as up to the present this species has not been found on the diseased plants. Much of the damage in the spring of 1929 may be attributable to the severity of the preceding winter.

Die-back of elms [*Graphium ulmi*: ibid., x, p. 138] continued to spread in the Stade district, many of the affected trees being partially or totally denuded of foliage in June.

BAUDYŠ (E.). **Zpráva o činnosti sekce fytopathologické v roce 1928.** [Report on the activity of the Phytopathological Section in 1928.]—Pamphlet issued by *Mor. Zem. Výzkumný Ústav Zemědělský v Brně* [*Moravian Territorial Agric. Exper. Inst. in* Brünn], 16 pp., 1930.

In this general report the only statement of mycological interest is that in 1928 in Moravia *Heterosporium allii* was found attacking cultivated garlic, and *Cladosporium fulvum* was observed on tomatoes, both fungi being new records for that country.

Trabajos de las secciones agronómicas provinciales, relativos a plagas de campo, en el año 1929. [Work of the Provincial Agricultural Sections relating to field pests in the year 1929.] —*Bol. Pat. Veg. y Ent. Agric.*, iv, 15–18, pp. 197–220, 1929. [Received December, 1930.]

Lists are given of the principal plant diseases observed at the Spanish Phytopathological Stations during 1929 [cf. *R.A.M.*, viii, p. 755].

SHARPLES (A.). **Division of Mycology. Annual Report for 1929.**—*Dept. of Agric. Straits Settlements and Fed. Malay States Technical Reports for the year 1929*, *Bull.* 3, Gen. Ser., pp. 62–72, 1930.

During 1929 further evidence was obtained that lightning-strike is of the first importance in the causation of diseases of coco-nuts in Malaya [*R.A.M.*, ix, p. 89]. In this connexion the author cites Dr. G. C. Simpson (*Nature*, [cxxv], 3134, 1929), to the effect that whereas electrical discharges to the ground from a positively charged cloud start high up in the atmosphere and branch out as they descend, discharges from a negatively charged cloud start on an earth-connected object, which takes the whole discharge. Positive discharges are found to be frequent but weak, and negative discharges are infrequent but very strong.

The theory is stated to accord with the facts of lightning-strike as they have been observed in Malaya, where only two, or at most three, negative discharges, which killed entire blocks of 100 to 200 coco-nut palms, have been observed since 1922. Positive discharges, on the other hand, are frequent but weak, the total losses on 1,400 acres during five years being only 288 palms, a few (up to 15) being killed almost every month.

An interesting feature is the 'delayed action' following lightning-strike, in which individual trees, remote from the area of discharge and apparently uninjured at the time, begin to show symptoms of disease eighteen months to two years later, probably as a result of slight shock.

The most important disease of oil palms (*Elaeis guineensis*) is a stem rot of undetermined origin [ibid., ix, p. 648].

The *Pythium* causing patch canker of *Hevea* rubber [ibid., viii, p. 674] is being compared with *P. complectens*. *P. aphanidermatum* [ibid., ix, p. 89] was isolated from *Tephrosia toxicaria*, and *P. splendens* attacked begonias. *Fomes lignosus*, *Ustulina zonata*, and symptoms resembling brown root disease [*Fomes lamaoensis*] were observed on tea roots. Gutta percha [*Palaquium gutta*] bushes on large areas of an estate in Pahang were severely attacked by the organism causing red rust of tea (*Cephaleuros*) [*parasiticus*]; *Albizzia moluccana* and *Tephrosia candida*, interplanted among the gutta percha bushes, were also heavily infected in the worst areas.

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1929.**—29 pp., 1930.

In the section of this report dealing with plant diseases (pp. 10–11) it is stated that wither-tip of limes [*Gloeosporium limetticolum*:

R.A.M., ix, p. 90] was very prevalent in St. Lucia during the wet period of January and February, 1929, but a good recovery was made.

Pod rot [*Phytophthora palmivora* and *Botryodiplodia theobromae*: ibid., viii, p. 20] and *Rosellinia* root disease [*R. bunodes* and *R. pepo*: loc. cit.] of cacao still constitute a source of anxiety. Agrisol has proved useful as a dressing for wounds left by the removal of diseased pods.

The survey of 114,373 coco-nut palms in 1929 showed the following percentages of disease: bud rot [*P. palmivora* or bacteria], 39·8; little leaf, 39·3; stem bleeding and bitten leaf [? *Ceratostomella paradoxa*], 12·3 and 8·6, respectively; and withering leaf disease [ibid., ix, p. 90], 0·2.

An inspection of sugar-cane fields showed that out of 10,507 stools examined 771 were affected by gumming disease [*Bacterium vascularum*: ibid., viii, p. 464] and 20 by 'bunchy top' a condition where the growing bud had become entangled in the stunted leaf tissue and subsequently decayed.

Biologist.—*Ann. Rept. Dept. of Agric., New South Wales, for the year ended 30th June, 1929*, pp. 19–20, 1930.

During the period under review losses up to 90 per cent. of the wheat crop were caused by flag smut [*Urocystis tritici*: *R.A.M.*, ix, p. 770] in certain north-western districts where continuous cropping is practised. The spores of the fungus remain viable under laboratory conditions for at least 5½ years after collection. Definite evidence was obtained of the infection of wheat in the seedling stage by *Helminthosporium sativum* [ibid., ix, p. 228].

Top rot (pokkah-boeng) of sugar-cane has been found to be due to *Fusarium moniliforme* [*Gibberella moniliformis*] in New South Wales as elsewhere [ibid., ix, p. 342, and below, p. 165].

Varietal tests of tomatoes for resistance to *Fusarium* [*lycopersici*: ibid., ix, p. 812, and below, p. 165] gave valuable results. In view of the increasing severity of this disease under greenhouse conditions, a method of soil disinfection with acetic acid was experimentally tested; the outcome of the trials was very satisfactory and the treatment (which cost about one penny per sq. ft.) is being applied on a commercial scale.

Varietal tests of beans [*Phaseolus vulgaris*] for resistance to anthracnose (*Colletotrichum lindemuthianum*) and root rot (*F. martii phaseoli*) yielded promising results. Bacterial blight of beans (*Bacterium phaseoli*) [see above, p. 151], pea blight (*Bact.* [*Pseudomonas*] *pisi*), *Septoria* blight of peas (*S. pisi*), and lettuce mildew (*Bremia lactucae*) were recorded for the first time in the State.

Infection of mandarins [*Citrus nobilis* var. *deliciosa*] by brown spot [*Colletotrichum gloeosporioides*: ibid., vii, p. 304] has been found to occur in the earliest stages of fruit development. Black spot (*Phoma citricarpa*) developed in a very severe form on all types of citrus during the spring. Brown rot of citrus (*Phytophthora hibernalis*) [ibid., ix, p. 450] has been reported from fresh localities, and psorosis or scaly bark [ibid., viii, p. 423; ix, p. 523] is also widespread, though not in an acute form.

Internal brown rot of peaches has been found to be a physiological disturbance associated with high temperature and humidity during the ripening stages. Plums in the coastal areas suffered from a similar derangement.

An introduced species of *Sporotrichum* originally found infecting cane borer beetles [? *Lepidoderma albohirtum*] readily attacked the banana borer [*Cosmopolites sordidus*] in laboratory tests.

Plant pathology.—*Forty-second Ann. Rept. Arkansas Agric. Exper. Stat. for the fiscal year ending June 30, 1930* (*Bull.* 257), pp. 72–85, 6 figs., 1930.

The following items of interest by E. C. Tullis, V. H. Young, and H. R. Rosen, in addition to information already noticed from other sources, occur in this report. Out of 348 cultures from diseased rice kernels, 163 produced species of *Alternaria*, *Dactylaria*, *Helminthosporium*, *Fusarium*, *Protascus*, and *Penicillium*, all of which were apparently pathogenic to the plants. Stem rot of rice (*Sclerotium oryzae*) [*R.A.M.*, ix, p. 484] was severe in several parts of Arkansas and was generally present in fields west of the Mermentau river in Louisiana and in Texas. The drainage of a badly infected field during the boot stage resulted in the production of a less diseased crop than usual. The maximum temperature for the growth of the fungus was found to be between 32·5° and 35° C., the minimum between 11° and 15°, and the optimum between 27·5° and 30°. On maize meal agar the best growth occurred at a hydrogen-ion concentration between P_H 4·05 and 6·1.

Further studies on wilt (*Fusarium vasinfectum*) resistance in cotton [ibid., viii, p. 718] confirmed the superiority of the long staple Super Seven variety, while a degree of tolerance was also shown by D. & P. L., Arkansas 17, and Express 121. Among the medium staple varieties, which are in general the best suited to Arkansas conditions, Arkansas Rowdens 40 and 2088 and Miller are highly resistant to wilt, while Rowden 2119 and Cleveland 54 are tolerant. Of the shorter stapled varieties, Dixie Triumph and Dixie 14 are highly resistant to wilt but late maturing, while Wilson Big Boll is tolerant but early, and therefore better adapted to a wider range of conditions. Preliminary experiments in Lee County indicate that potash-containing fertilizers may assist in the control of wilt, and also that dense sowing may help to improve the yield where the incidence of the disease is high. The incubation period of *F. vasinfectum* appears to be greatly prolonged by the low soil temperatures prevailing in April and early May.

Department of Botany and Plant Pathology.—*Oregon Agric. Exper. Stat. Director's Bienn. Rept. 1926–28*, pp. 78–82, 1930.

In addition to items already noticed from other sources this report contains the following observations of interest. Very successful results were obtained in the transmission of narcissus mosaic [*R.A.M.*, viii, p. 311] by simple leaf mutilation, but the means of spread in nature is still unknown. The latter statement is equally applicable to iris mosaic [ibid., x, p. 83], which is

readily transmissible by almost any mechanical method of inoculation and is also carried by several kinds of aphids.

All the commercial varieties of black raspberry [*Rubus occidentalis*] grown in Oregon, viz., Munger, Plum Farmer, and Cumberland, have been found susceptible to wilt (*Verticillium*) [*alboatrum*: ibid., viii, p. 295]. During the first, second, or third year after inoculation with the fungus, 30 to 40 per cent. of the plants showed dying-off of some or all the canes, while the uninoculated controls, set 9 ft. away from the infected individuals, remained healthy until the third year, when 2 per cent. became diseased.

Leaf roll of the potato is readily transmitted in Oregon by *Myzus persicae*, *M.* [*Macrosiphum*] *pelargonii*, and *Myzus circumflexus* [ibid., viii, p. 789; x, p. 49], none of which is common in the State, while the ordinary potato aphid, *Illinoia solanifolii* [*Macrosiphum gei*] rarely transmits the disease. Leaf roll was found to be transmissible by means of *Myzus persicae* from potato to tomato, pepper [*Capsicum annuum*], black nightshade [*Solanum nigrum*], Jimson weed [*Datura stramonium*], bittersweet (*S. dulcamara*), and *D. tatula*. Rugose mosaic was successfully transmitted by artificial inoculation from potato to tomato and *S. nigrum*.

Some degree of protection against the storage decay of Bing and Lambert sweet cherries caused by brown rot (*Sclerotinia cinerea* forma *pruni*) and blue mould [*Penicillium* spp.] was afforded by placing absorbent paper soaked in formaldehyde at the tops and bottoms of the boxes at the time of packing. Excellent results were given by dusting the fruit with a powder composed of diatomaceous earth impregnated with formaldehyde, but the presence of this substance on the fruit is considered objectionable. *S. cinerea* forma *pruni* was also responsible for severe blossom blight of cherries in western Oregon during 1929–30, *S. americana* being less injurious [ibid., ix, p. 661, and above, p. 159]. A thorough pre-blossom spray of Bordeaux mixture, applied just as the petals show white, gives satisfactory control of this disease. A fungus isolated from cherry buds dying during the winter has produced, on inoculation into apples, a condition indistinguishable from perennial canker and anthracnose [*Gloeosporium perennans* and *Neofabraea malicorticis*: ibid., ix, p. 50; x, p. 114; and below, p. 193]. It is thought, however, that physiological factors are also involved in the etiology of the cherry blight.

Four distinct root troubles have been observed in strawberry plantings during the period under review, namely, root rot (*Armillaria mellea*) [ibid., viii, p. 727], which is confined to newly cleared land or sites previously occupied by orchards or shrubby plants; disturbances due to high water-table and adverse soil conditions (affecting the Ettersbury 121 and Marshall varieties); winter injury; and the formation of small, dark cankers on the roots and outer crown layers by *Rhizoctonia* sp.

Filberts [*Corylus avellana*] were seriously damaged by an organism closely resembling *Bacterium juglandis*, the causal organism of bacterial blight of walnuts.

In 1928, 201 varieties of 26 vegetable crops were tested for resistance to 'curly top', [ibid., viii, p. 623], and in 1929 trials for the same purpose were made with 418 varieties of 20 crops.

A fungus isolated from wheat plants affected by the so-called 'north-western foot rot disease' has been proved to be pathogenic and to possess a conidial stage similar to *Cercosporella herpotrichoides* [ibid., ix, pp. 237, 641].

Preliminary studies have been conducted, *inter alia*, on the basal cankers of red raspberries (stated on p. 18 to be responsible for an annual loss to growers of $75,000, and to be due to the joint action of yellow rust [*Gymnoconia interstitialis*] and cane blight [*Leptosphaeria coniothyrium*: ibid., x, p. 117].

Division of Botany.—*Forty-ninth Ann. Rept. New York (Geneva) Agric. Exper. Stat. for the fiscal year ended June 30, 1930*, pp. 40–50, 1930.

This report contains the following references of phytopathological interest in addition to those already noticed from other sources. No reliable method of detecting the presence of leaf roll in potato tubers has yet been found. Usually a tendency to the disease is indicated by slender, spindling, and abnormally long sprouts, the rejection of which eliminates about two-thirds of the leaf roll in Irish Cobblers; with the Rural and Green Mountain varieties, however, this method is less successful. The occurrence of aphids on the sprouts of unplanted potatoes has not previously been reported in the United States, and it is therefore of interest to record the detection of *Myzus persicae* on the sprouts of potato tubers in grocery stores during the last three years. It is suspected that these insects may also occur on sprouting seed potatoes and play an important part in the spread of leaf roll and other virus diseases [*R.A.M.*, iii, p. 161, and preceding abstract].

The extreme susceptibility to mosaic of Refugee beans [*Phaseolus vulgaris*: *R.A.M.*, ix, p. 755] is stated to lead to extremely heavy losses.

The symptoms of red raspberry mosaic have been found to appear in the black varieties [*Rubus occidentalis*] under the form previously known as mild mosaic [ibid., ix, p. 394]. In Plum Farmer mild mosaic on the fruiting laterals was definitely correlated with 80 per cent. of the plants showing red raspberry mosaic later, and only 5 per cent. of those showing mild mosaic failed to develop recognizable symptoms of red raspberry mosaic. In Cumberland mild mosaic on the foliage of fruiting laterals was definitely correlated with 91 per cent. of those showing red raspberry mosaic symptoms later, but 67 per cent. of the plants with mild mosaic failed to develop pronounced symptoms of red raspberry mosaic. It is thought that differences in susceptibility (Plum Farmer being susceptible and Cumberland less so) may account for the differences in the degrees of correlation observed, but proof of this hypothesis is difficult to obtain owing to the failure of experiments in the transmission of mild mosaic.

Yellow mosaic [ibid., viii, pp. 91, 731] was found to spread more slowly in Plum Farmer and Cumberland black raspberries than red raspberry mosaic. Yellow mosaic assumes such a severe form that affected plants are rapidly killed; hence they do not act for any length of time as foci for the dissemination of the disease. In a plot containing 62 varieties and 125 Station seedlings (all red

raspberries) yellow mosaic has developed in sufficient abundance to yield some data on the susceptibility of a large number, whereas red raspberry mosaic is present only in a few. It has been found that susceptibility to yellow mosaic arises as a result of crossing the Cuthbert variety with Newman or Herbert, or Herbert with June. On the other hand, crosses of Herbert and Newman have shown a high degree of resistance to yellow mosaic.

Mild streak [loc. cit.] was found to spread very slowly in Plum Farmer and Cumberland black raspberries, but Ohio proved highly susceptible to this trouble.

The best control of bacterial wilt of cucumbers (*Bacillus tracheiphilus*) [ibid., viii, p. 294] was obtained by spraying with 3 lb. kayso, 3 lb. calcium arsenate, and water to make 50 gallons, or dusting with monohydrated copper sulphate, calcium arsenate, and hydrated lime (20–25–55).

Plant pathology.—*Louisiana Agric. Exper. Stat. Rept. for the years 1928-1929*, pp. 52–57, 1930.

This report contains the following items of interest in addition to those already noticed from other sources. In a tomato variety test at Baton Rouge in 1929 by Edgerton and Tims, the wilt [*Fusarium lycopersici*]-resistant Louisiana Pink and Louisiana Red greatly outyielded the other commercial varieties included in the trial (average weight of fruit per plot 136·1 and 140·4 lb., respectively, compared with 51·4 to 94·3 lb. for the remaining sorts [see above, p. 161].

Sclerotium wilt of beets [*S. rolfsii*: *R.A.M.*, vi, p. 599] causes heavy losses (up to 75 per cent) in warm weather. In experiments by Tims the application of lime or other fertilizers failed to reduce the incidence of infection.

Several years' investigations by Edgerton, Tims, and Mills have shown that selected strains of certain sugar-cane varieties, e.g., D. 74 and Purple, are tolerant of mosaic disease [ibid., vi, p. 599; viii, p. 264]. In 1929 plots of selected D. 74 yielded at the rate of 23·6 tons per acre compared with only 17·3 tons from unselected canes, while in 1928 plots of selected D. 74 produced up to 36 tons per acre. Red rot (*Colletotrichum falcatum*) is quite destructive on certain cane varieties, and has been found commonly attacking the midribs of the leaves. A culture from the leaves was found to be more pathogenic to Co. 281, C.P. 117, C.P. 807, P.O.J. 36, and P.O.J. 36 M. than to the susceptible Purple varieties. The pokkah-boeng disease is most severe on the P.O.J. 234, P.O.J. 2727, C.P. 177, Striped, and Purple cane varieties. The fungus alleged to be responsible for the disease (*Fusarium moniliforme*) [*Gibberella moniliformis*: see above, p. 161] has been isolated by the above-mentioned investigators from affected canes and inoculated into healthy ones with positive but not altogether consistent results.

STRONG (R. P.) & SHATTUCK (G. C.). **Plant diseases.** [*ex* The African Republic of Liberia and the Belgian Congo.]—*Contr. Dept. Trop. Med. & Inst. Trop. Biol. & Med.*, v (*Harvard African Expedition 1926–1927*), pp. 389–410, 26 figs., 1930.

Mandioca (*Manihot palmata*) plants throughout Liberia and in

parts of the Belgian Congo were found to be affected by a disease of the mosaic type, causing distortion, curling, and shrivelling of the leaves, general stunting, and chlorosis. The latex of diseased plants was found to contain both rounded, uniformly staining cells, 2 to 4 μ in diameter, suggestive of a fungus, and smaller, slender bacillary bodies up to about 2 μ in length; the latter were also found in small numbers in healthy plants. Cultures made from the latex of a number of diseased plants yielded on two occasions a reddish-brown fungus, but these cultures were accidentally lost. A histological study of preserved material of diseased plants revealed a small number of the bacillary bodies and also larger, circular ones, 2·4 to 4·5 μ in diameter, or occasionally dumb-bell-shaped, believed to be fungus spores. The writers consider that the fungus probably plays a part in the causation of the disturbance, but since the organism was not present in all the plants examined it can hardly be more than a secondary invader following virus infection [cf. *R.A.M.*, ix, pp. 19, 765].

Phytophthora meadii (identified by D. H. Linder, the botanist accompanying the expedition) was the only fungus of any importance found on *Hevea* rubber trees; it was sometimes associated with a species of *Fusarium*, probably a saprophyte.

IVANOFF (S. S.) & RIKER (A. J.). **Studies on the movement of the crown gall organism within the stems of Tomato plants.**—*Phytopath.*, xx, 10, pp. 817–829, 1 fig., 1 graph, 1930.

The detection of the crown gall bacteria (*Phytomonas* [*Bacterium*] *tumefaciens*) in the stems of tomato plants shortly after their introduction through needle punctures was facilitated by mixing Gram-positive bacteria or Burri's India ink with the inoculum [*R.A.M.*, ix, p. 418]. The organisms were found in the needle cavity, in ruptured cells, and in intercellular spaces, and in the stained preparations appeared as strands, sometimes continuous and with convex tips, as clumps of a number of individuals, and as individual cells, all three types of distribution being observed in the same slide. The distances traversed by the bacteria within the first four hours after introduction into the stems were quite variable. No significant progressive movement attributable to growth was observed, and in fact several lines of evidence suggest that such physical forces as capillarity and negative pressure may be the primary factors in the dispersion of the organisms through the intercellular spaces. The physiological disturbances incident to the inoculations must also be considered in this connexion. Dead crown gall bacteria and India ink showed the same types of distribution and moved about the same distances as the living organisms.

RIKER (A. J.), BANFIELD (W. M.), WRIGHT (W. H.), KEITT (G. W.), & SAGEN (H. E.). **Studies on infectious hairy root of nursery Apple trees.**—*Journ. Agric. Res.*, xli, 7, pp. 507–540, 4 figs., 1 diagr., 1930.

This is a full account of the authors' study of the organism causing infectious hairy root of apple, the isolation of which was recorded in preliminary reports [*R.A.M.*, viii, p. 159; ix, p. 596].

Out of 96 overgrowths of the hairy root type, including woolly knot [ibid., ix, p. 188], which were collected from 12 representative nurseries in seven of the United States, 13 did not yield any pathogenic organism, one gave cultures that were apparently mixtures of the crown gall and hairy root organisms, and 78 yielded the hairy root organism. Inoculations with the latter gave positive results on the stems of apple, rose (*Rosa setigera*), honeysuckle (*Lonicera morrowi*), sugar beet, bean (*Phaseolus vulgaris*), and the Paris daisy [*Chrysanthemum frutescens*], but little or no response was induced in stems of tomato and tobacco. Typical cultures of the hairy root organism were re-isolated from 40 hairy root overgrowths produced by inoculations, and re-inoculations with these cultures produced typical hairy root on apple in every case.

Studies on the seasonal development of the overgrowths produced on the underground parts of Wealthy apple stems by inoculations with the hairy root organism and with *Bacterium tumefaciens* showed that the first signs of differentiation between hairy root and crown gall symptoms appeared at the end of two months after inoculation, though a confusion of the two was still possible at this stage; the symptoms were clearly and typically differentiated within three months. Many of the roots produced by inoculations were killed during winter in Wisconsin, but new roots of a similar type appeared the following spring, and it was noted that during the second year after inoculation deeply convoluted knots were often present at the places of inoculation. The nature of these knots needs further investigation.

Considerable details are given of the bacteriological study of five strains of *Bact. tumefaciens*, ten strains of the hairy root organism, and three strains of *Bacillus radiobacter*, and the cultural characters of the three organisms are shown in a comparative table. The poured plate method proved inadequate consistently to separate the crown gall and hairy root organisms from each other, and the results obtained in this study were controlled and extended by an investigation of cultures which were progenies of single cell isolations [see next abstract].

The hairy root organism [a technical description of which is appended] is named *Phytomonas rhizogenes*, but the authors point out that, according to other systems of classification, alternative names for it are *Bacterium rhizogenes* and *Pseudomonas rhizogenes*. It is a short, non-sporulating (but forming capsules), Gram-negative, not acid-fast rod, 0·55 to 2·59 by 0·15 to 0·75 μ (average 1·44 by 0·43 μ) in diameter, provided with a polar flagellum. It does not grow at hydrogen-ion concentrations below P_H 4, and the optimum temperature for its growth is between 20° and 28° C.

WRIGHT (W. H.), HENDRICKSON (A. A.), & RIKER (A. J.). **Studies on the progeny of single-cell isolations from the hairy-root and crown-gall organisms.**—*Journ. Agric. Res.*, xli, 7, pp. 541–547, 4 graphs, 1930.

After briefly describing the technique used by them for single cell isolations of *Bacterium tumefaciens* and *Bact. rhizogenes* from apple malformations [see preceding abstract], the authors give details of the bacteriological characters [which are also compared

in an appended table] of the cultures thus raised of the two organisms. The cultures are stated to have been remarkably consistent in their behaviour and in the reactions typical for each organism. Out of four single cell isolations that were made from a culture showing a mixture of the characters of both organisms, and which were studied in culture and in inoculation tests, one consistently showed the typical characters of the crown gall organism, and the three others those of *Bact. rhizogenes*. It is considered, therefore, that reports of variations within these species are open to question when they are not based upon studies of single cell isolations.

ALLEN (RUTH F.). **A cytological study of heterothallism in Puccinia graminis.**—*Journ. Agric. Res.*, xl, 7, pp. 585–614, 17 pl., 1930.

This is a detailed and fully illustrated account of the author's cytological investigation of the development of *Puccinia graminis* in the leaf tissues of the European barberry, a preliminary communication on which has already been noticed [*R.A.M.*, ix, p. 93]. On germinating, the sporidium of *P. graminis* penetrates the outer wall and enters the epidermal cell, where it forms a primary hypha of four to six cells; each of the latter gives rise to a branch which grows down to the subepidermal area and forms a haploid mycelium. As a rule, the intercellular hyphae are vigorous and well-formed, while the few that develop intracellularly are stunted, misshapen, and short-lived. Not infrequently several entries of the fungus in one epidermal cell may occur, in which case the mycelia interlace; no clear-cut case was observed, however, of a fusion of vegetative cells, and the young interlaced mycelia always remain haploid. Pycnidia begin to develop on the fourth day from infection, and each of the pycnosporophores contained in them gives rise to a succession of spores. An isolated unisexual infection produces from three or four to two dozen or more haploid aecidia which attain considerable size, undergo the first differentiation into spores, and then become impoverished and die.

When pycnospores of one sex are transferred to a pycnidium of opposite sex, small granules appear in the paraphyses; these granules may be nuclei of the pycnospores. Later, cells with two or three nuclei are found in the wall of the pycnidium and in the hyphae leading from it. The gametophytic component of the aecidium forms as in the sterile infection, but from its very inception sporophytic cells are found scattered throughout it. These cells may contain two, three, or four nuclei, and three days after the transference of the pycnospores, cells with three to six nuclei are common. On the fourth day these multinucleate cells push down into the sterile 'space-making' tissue of the aecidium to produce spore chains. Just before the first division a multinucleate cell contains eight or ten nuclei which are utilized in forming the binucleate spore-mother cells, so that the number in the basal cell steadily decreases. In well-established spore chains the basal cells are regularly binucleate.

Soon after the appearance of the sporophytic generation in an infection the pycnidia cease forming spores, and the pycnosporo-

phores elongate and finally block the pycnidial cavity. The paraphyses wither and secondary paraphyses are not formed. The pycnidia of fertile infections die, while the rest of the infection remains living and active.

NEWTON (MARGARET), JOHNSON (T.), & BROWN (A. M). **A study of the inheritance of spore colour and pathogenicity in crosses between physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, x, 12, pp. 775–798, 8 figs., 1930.

In investigations [which are fully described] into the inheritance of colour and pathogenicity in crosses between abnormally coloured physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, vii, p. 235; ix, p. 365; x, p. 16], crosses between form 36 (greyish-brown strain) and form 9a (orange), in which pycnidial nectar was transferred from pustules of the former to those of the latter, gave rise to form 17a, of normal (red) uredospore colour. Two crosses made in the opposite direction between the same two forms gave rise to physiologic form 17, also of red uredospore colour. The hybrid forms 17 and 17a differed only in their pathogenicity on Marquis and Kota, on which form 17 produced a (4) type of infection, and form 17a a (3 –) type with chlorosis. In all the crosses except those between forms 9 and 15 the maternal parent form (i.e., the form to which the pycnidial nectar of another is applied) modified the pathogenicity of the hybrid by impressing on it some of its own characters, which did not appear, however, to be transmitted by its pycnospores. That the hybrid thus resembled the maternal parent form more than the other parent form is considered to be most satisfactorily explained by cytoplasmic or maternal inheritance.

When a cross in both directions was made between forms 9 and 15, of normal (red) uredospore colour, the first generation hybrids from both the reciprocal crosses were red in uredospore colour, and were identified as physiologic form 9, the pathogenic characters of form 9 dominating over those of form 15.

So far only two physiologic forms of *P. graminis*, 36 and 52, out of the eight studied by the authors, have proved to be heterozygous for colour factors, producing a few cultures of a greyish-brown colour. Form 15 showed some evidence of a similar heterozygosity, while form 9a is homozygous for the orange colour.

The first generation hybrids from the cross 9a (orange) × 52 (greyish-brown) were of normal (red) uredospore colour and were identified as form 9; the hybrids from the reciprocal cross, 52 × 9 a, were identified as form 9a of different pathogenicity. This difference in pathogenicity between the hybrids is attributed to cytoplasmic inheritance.

All the first generation hybrids from crosses in both directions between form 14 (red) and form 36 (greyish-brown) were of normal (red) colour; the hybrids from the crosses 14 × 36 were identified as forms 11 and 88; those from the reciprocal crosses were identified as forms 11a and 14. These differences between the hybrid forms are also attributed to cytoplasmic inheritance.

Some of the first generation hybrids from crosses between forms

9a (orange) and 36 (greyish-brown) and from those between forms 9a (orange) and 52 (greyish-brown) were orange in spore colour; this cannot be explained, except by mutation.

The second generation hybrids of the cross 36 × 9a fell into red, orange, greyish-brown, and white colour groups, and belonged to one or other of the physiologic forms, 1, 11, 15, 17, 36, 57, or 85. Neither colour nor pathogenicity inheritance could be placed definitely on a factorial basis, although the distribution of the second generation hybrid forms suggested a trihybrid ratio.

Some of the second generation hybrids of the cross 9 (red) × 15 (red) were greyish-brown, indicating that one of the grand-parental forms, probably form 15, was heterozygous for the factors determining greyish-brown. The hybrids were one or other of the physiologic forms 9, 15, 57, and 85. The population of second generation hybrids was too small to permit a factorial basis to be established for the inheritance of colour or pathogenicity.

In some of the forms in the second generations of the crosses 36 × 9a and 9 × 15 there appeared to be an association between colour and pathogenicity.

GOULDEN (C. H.), NEWTON (MARGARET), & BROWN (A. M.). **The reaction of Wheat varieties of two stages of maturity to sixteen physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, xi, 1, pp. 9–25, 22 figs., 1930.

When fourteen [named] wheat varieties differing widely in their degree of resistance or susceptibility to stem rust (*Puccinia graminis tritici*) [*R.A.M.*, vi, p. 154; viii, p. 707; ix, p. 633] were tested, both in the mature and seedling stages, for their reaction to 16 physiologic forms of the fungus, the varieties Garnet, Marquis, Quality, Vernal, Khapli, and Iumillo agreed closely in the behaviour of both stages; Hope, H–44–24, Pentad, Acme, and Black Persian showed very different reactions in the two stages, while in Reward, Kota, and Marquillo the two stages agreed imperfectly, the mature plants being on the average more resistant than the seedlings. In the three last-named varieties the presence of mature plant resistance was definitely established, while the low percentage of rust on Vernal and Iumillo indicated that they also possess mature plant resistance. The increased resistance shown by the varieties in the third group as they approached maturity is explained on the basis of the development of a type of resistance different from that observed in the seedling stage. The varieties possessing mature plant resistance reacted fairly uniformly in the mature stage to the 16 physiologic forms, indicating that plants with this sort of resistance are, in general, resistant to all forms.

All these varieties, especially Marquis and Quality, tended when mature to resist more actively in some regions than in others, particularly above the nodes and on the culms between the top leaf and the head; the term 'regional resistance' is suggested as expressing this.

The results obtained are shown to support, in broad outline only, the theory of functional resistance through stomatal behaviour [ibid., ix, p. 295].

SIBILIA (C.). **Ricerche sulle ruggini dei cereali. II. La germinazione delle teleutospore di 'Puccinia graminis' e 'P. triticina'.** [Researches on cereal rusts. II. The germination of the teleutospores of *Puccinia graminis* and *P. triticina*.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 164–190, 5 figs., 1930.

In this account of the author's further investigations [which are fully described] into the germination of the spores of *Puccinia graminis* and *P. triticina* [*R.A.M.*, viii, p. 162] it is stated that all attempts to germinate the teleutospores of *P. graminis* in hanging drop cultures, whether in plain water or nutrient liquids, gave negative results, though germination was readily obtained during March after immersion for 15 minutes in various [named] organic and inorganic acids with a P_H value of approximately 2. Exposure for four minutes at a distance of 15 cm. to ultra-violet radiation through a Wood's screen stimulated germination even when the acid solutions were no longer able to promote it [cf. ibid., v, p. 731], while exposure for 30, 60, and 90 minutes, respectively, to the infra-red rays was still more effective. Immersion for various periods up to 24 days in running water at 11° C. resulted in the emergence of very long, septate hyphae from the cells and peduncle, without the formation of true promycelia or sporidia. The teleutospores of *P. triticina* could not, however, be germinated by any of these methods.

Teleutospores of *P. graminis* formed in 1928 ceased germination by March, 1930, while by the end of April only very few of the previous year's teleutospores were still germinating after physical or chemical stimulation.

STAKMAN (E. C.) & FLETCHER (D. G.). **The common Barberry and black stem rust.**—*U.S. Dept. of Agric. Farmers' Bull.* 1544, 28 pp., 11 figs., 3 diags., 1 map, 1930.

This is a revised account of the first-named author's previous notes on the relation between the common barberry (*Berberis vulgaris*) and stem rust of wheat and other cereals [*Puccinia graminis*] in North America [*R.A.M.*, vii, p. 310]. The number of barberry bushes destroyed between 1st April, 1918, and 30th June, 1930, is estimated at 18,192,818, but in view of the extremely rapid multiplication and spread of this pest the relaxation of the eradication campaign must not be contemplated. The loss of wheat from stem rust in the north-central and mountain States during 1929 is calculated at 6,364,000 bushels, while in 1927 it amounted to 32,423,000, the average for the 5-year-period 1925–29 being 11,446,000.

GASSNER (G.) & STRAIB (W.). **Über das Auftreten einer neuen Gelbrostform auf Weizen.** [On the occurrence of a new form of yellow rust on Wheat.]—*Der Züchter*, ii, 11, pp. 313–317, 2 figs., 1930.

In the summer of 1930 the writers observed that the v. Rümker's Dickkopf and Heine's Kolben wheat varieties, normally highly resistant to yellow rust (*Puccinia glumarum*), were severely attacked by the fungus in selection plots at Hadmersleben [Saxony].

At the same time a number of other ordinarily susceptible varieties showed little or no infection. Observations were subsequently made at Emersleben and Schlanstedt (short distances south-west and north-west, respectively, from Hadmersleben). In the former place the two above-mentioned varieties and also the normally resistant Janetzki's summer wheat were heavily attacked and the ordinarily susceptible varieties free from rust, while in the latter the rust behaved as usual.

Suspecting that the abnormal behaviour of the Dickkopf and Kolben varieties was the result of infection by a new physiological form of the rust [*R.A.M.*, ix, p. 514], the writers carried out a series of greenhouse inoculation tests to determine the pathogenicity of the Hadmersleben and Emersleben strains on the one hand, and of the Schlanstedt form on the other, to the above-mentioned and other wheat varieties. Seedling plants with two leaves were inoculated with spore suspensions of the rust. The Hadmersleben and Emersleben strains produced 100 per cent. infection on Kolben, whereas Strube's Dickkopf showed not the least trace of injury. With the Schlanstedt strain the position was exactly reversed. In a second test the Hadmersleben and Emersleben strains caused heavy infection of v. Rümker's Dickkopf and Kolben, while Strube's Dickkopf was highly resistant though not quite immune, as in the first experiment. With the Schlanstedt strain the position was again reversed. The Michigan Amber variety proved susceptible to the Hadmersleben and Emersleben strains as well as to that from Schlanstedt.

It is apparent from these data that there are two distinct physiological forms of *P. glumarum* in the important wheat-growing regions of western Germany. The practical significance of the newly detected form must be determined by further investigation.

APPEL (O.). **Beiträge zur Kenntnis der physiologischen Formen des Weizengelbrostes.** [Contributions to the knowledge of the physiologic forms of the yellow rust of Wheat.]—*Angew. Bot.*, xii, 6, pp. 463–470, 1930.

A summary is given of recent investigations in Germany on the occurrence of specialization in yellow rust of wheat (*Puccinia glumarum*) [see preceding abstract].

KRAUSS (J.). **Der Einfluss der Wasserstoffionenkonzentration auf Adsorption und Beizwirkung von Sublimat bei der Steinbrandspore (Tilletia tritici).** [The influence of the hydrogen-ion concentration on the adsorption and fungicidal action of sublimate in relation to the bunt spore (*Tilletia tritici*).]—*Fortschr. der Landw.*, v, 19, pp. 637–640, 2 diags., 2 graphs, 1930.

Full details are given of the technique and results of tests in which the adsorption of mercury (in the form of a mercuric chloride solution of 11·924 gm. $HgCl_2$ in 2,000 c.c. of water) by wheat bunt (*Tilletia tritici*) [*T. caries*] spores was measured in two buffer series (phosphate and acetate) with a constant salt content [cf. *R.A.M.*, ix, p. 444].

It was found that the adsorption of the mercury-ions was retarded by hydrogen-ions and accelerated by hydroxyl-ions. The fungicidal value of mercuric chloride is augmented by a high hydrogen-ion concentration, notwithstanding decreased adsorption. A similar relationship was found to hold good for uspulun and germisan. The superior toxicity of the latter preparation is attributed in part to the tendency of cyanmercuricresol to form elementary mercury. In these tests the toxicity of uspulun was lost much sooner through contact with the spores than that of germisan.

Sawdust and talcum behaved similarly to the bunt spores in regard to the adsorption of mercuric chloride, a fact which may be of interest in connexion with recent developments in timber preservation [ibid., vii, pp. 293, 754].

MEHTA (K. C.). **Studies on the annual recurrence of 'powdery mildews' of Wheat and Barley in India, I.**—*Agric. Journ. India*, xxv, 4, pp. 283–285, 1 col. pl., 1930.

Powdery mildew of wheat and barley (*Erysiphe graminis*) [*R.A.M.*, ix, pp. 370, 643] is stated to be of little importance in the plains of India, whereas the disease assumes a serious form in the Kumaon Himalaya and the neighbourhood of Simla. In October, 1927, a culture of *E. graminis* was started at Agra with conidial material brought down from Muktesar. After the middle of April all inoculations gave negative results, the conidia losing their viability at high temperatures. Perithecia collected at harvest time from fields in and at the foot of the hills invariably proved to be sterile. It seems probable, therefore, that the wheat and barley crops in the hills contract infection from the conidia found in profusion on self-sown plants at sowing time. The annual recurrence of the powdery mildews seems to be mainly due to the survival in the hills of the conidial stage, which develops during December to January following the October to November infection. The regular occurrence of the disease at the foot of the hills and its occasional development in the plains are probably attributable to the agency of wind-blown spores from the Himalaya [cf. ibid., viii, p. 490].

LEUKEL (R. W.). **Seed treatment for controlling covered smut of Barley.**—*U.S. Dept. of Agric. Tech. Bull.* 207, 22 pp., 1 fig., 1930.

This is a brief report of the results [which are presented in the form of tables] obtained in experiments from 1925 to 1929, inclusive, at the Arlington Experiment Farm, Virginia, in the control of covered smut (*Ustilago hordei*) of barley [cf. *R.A.M.*, ix, p. 517]. Satisfactory control of the smut was obtained by steeping the seed-grain (Tennessee Winter barley) for one hour in any one of the following solutions: 1 in 320 formaldehyde, 0·5 per cent. semesan, 0·5 per cent. uspulun, 0·25 per cent. germisan, 0·25 per cent. tillantin (uspulun universal), 0·25 per cent. corona 620, and 0·5 per cent. Bayer compound. It is pointed out, however, that the two last-named preparations are no longer being manufactured.

Experiments with over 45 dusts, some of which were prepared

in the author's laboratory and are not on the market, indicated that *U. hordei* is amenable to control by the more effective dust fungicides under average soil moisture conditions. Among the best preparations are cited höchst (trockenbeize tillantin), abavit B, and ceresan. The effectiveness of the dusts seemed to be independent of the reaction of the soil and, as far as could be determined, of the usual range of soil temperature, but a soil moisture content of less than 25 per cent. of saturation decreased the efficacy of most of the dusts tested.

The paper terminates with a brief discussion of the advantages of dusting over steeping, especially with formalin and copper sulphate solutions, which often cause seed injury and a reduction in stand and yield of the plants.

PEGLION (V.). **La formazione dei conidi e la germinazione delle oospore della 'Sclerospora macrospora' Sacc.** [The formation of the conidia and the germination of the oospores of *Sclerospora macrospora* Sacc.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 153–164, 4 figs., 1930.

During 1928–9 the author observed *Sclerospora macrospora* [*R.A.M.*, ix, pp. 513, 774] on wheat growing near the banks of rivers in various parts of central Italy. This organism develops on cereals only after they have been submerged, and when severe floods occur infection may develop on a vast scale, though generally the attacks are confined to the low-lying, inadequately drained edges of fields.

When winter wheat becomes infected as a result of floods during the autumn, the seedlings develop numerous tillers which are chlorotic and liable to wither rapidly, but without any marked deformation.

When the plants are attacked at the renewal of growth in the spring they show as they come into ear a luxuriant vegetation; the leaves are more turgid than normal and after some days develop a diffused chlorosis. Many of the plants wither before heading out; others develop culms which may remain normal, but most of which show characteristic deformation, especially in the last leaf enveloping the ear and in the ear itself.

As an example of the influence exercised on the affected plants by the condition of the soil a case is cited of wheat growing on a mud flat repeatedly flooded in the autumn of 1928 and again in the following March. To remedy the diffused yellowing noted at the renewal of vegetation and attributed to unfavourable soil conditions, the owner twice applied nitrate of soda at the rate of 50 kg. per hect. Subsequently numerous tillers developed, some showing normal ears, but in others the deformations characteristic of infection by *S. macrospora* were marked, and were accompanied by complete sterility in many plants. The precocious type of infection may escape the notice of those who expect only the more usual symptoms on the ears.

Phragmites communis was found to develop characteristic infection of the current year's shoots but no marked deformation of the leaves. This host is considered to be a constant source of infective material, which is carried by means of flood water to wild

and cultivated cereals growing in the vicinity of the rivers where *P. communis* is found.

Holcus lanatus is also affected, and material from this host showed, arising from the stomata, papillate, lemon-shaped conidia measuring 60 to 70 by 38 to 52 μ and attached by means of a short peduncle to the mycelium aggregated along the veins of the leaf; they appeared to originate in mycelial clusters, which the author regards as rudimentary conidiophores, in the hypostomatic cavities. The characters of these conidial fructifications on *Holcus* leaves generally resembled those of *Phytophthora* rather than *Sclerospora*.

Referring to the important part played by the oospores in the conservation of the species and the spread of infection, the author states that there are two types of oospore formation in the genus represented, respectively, by *S. graminicola* (near which can be placed *S. noblei* and *S. northi*) [ibid., ix, pp. 249, 320], and by *S. macrospora*. The formation of the oospores in *S. graminicola* resembles the behaviour characteristic of certain Ustilagineae, where sporulation is preceded by the development of lysogenous cavities in the host tissues, in which the mycelium is localized; when spore formation is completed the oospores form loose masses between the fibres, the fibrovascular bundles, and the remains of the epidermis, and are readily disseminated by natural agencies. The oospores of *S. macrospora* remain embedded in the parenchyma or the fibrovascular bundles.

Numerous preliminary attempts to germinate the spores of *S. graminicola* and *S. macrospora* gave negative results except in one instance, when the author observed an oospore of *S. macrospora* to open, with the formation of a large macroconidium on a short peduncle. In later tests fragments of leaves bearing the oospores of *S. macrospora* were placed on blotting-paper in Petri dishes at laboratory temperature. Early in December, 1929, a few oospores began to germinate: the thickened oogonial wall, closely adhering to the epispore, split, a thin-walled germ-tube emerged and elongated, and a large macroconidium formed at the tip. The whole contents of the oospore were extruded to form this organ, which was separated off from the empty germ-tube by a septum and became detached. The mature macroconidia thus formed were lemon-shaped, with a well-marked papilla, and measured 75 to 80 by 55 to 60 μ. They are probably zoosporangia, as they were frequently observed to have emptied, and except in rare instances, where the papilla showed signs of having developed into a germ-tube, the emptied spores had the papilla sharply truncated and zoospores were abundantly present in the surrounding water.

The germinating oospores were few compared with the numbers present in the host tissues. In the author's experiments the first germinations were invariably noted after the leaves had remained 15 to 20 days in a damp chamber at a temperature not exceeding 18° C.

DIETZ (S. M.). **The varietal response and inheritance of resistance in Barley to Erysiphe graminis hordei P.F. 4.**—*Iowa State Coll. Journ. of Sci.*, v, 1, pp. 25–31, 1 pl., 1930.

This is an enlarged account of the writer's studies on the genetics

of resistance of barley to *Erysiphe graminis hordei* physiologic form 4 carried out at the Iowa State College, a preliminary announcement of which has already been noticed [*R.A.M.*, ix, p. 370]. The methods employed are described and full tables are given of the reaction of the various hybrids, on which data the conclusions previously reported were made. Of the 90 pure lines of barley tested Goldfoil C.I. 928, Unnamed C.I. 96, Hanna C.I. 906, and Duplex C.I. 2433 were highly resistant, while the following good commercial varieties were completely susceptible: Horsford C.I. 610, Chevalier C.I. 278, Hannchen C.I. 531, Manchuria C.I. 245, Nepal C.I. 475, Odessa C.I. 927, Oderbrucker C.I. 940, Triebi C.I. 936, and Velvet C.I. 4252.

E. graminis hordei is a destructive parasite of barley in most parts of the United States, being particularly severe in the southern sections where the crop is sown in the autumn. In Iowa, however, the damage has been relatively slight during the past twelve years.

SCHULZ (G.). **Der Einfluss der Ernährung des Getreides auf den Befall durch Erysiphe graminis D.C.** [The influence of the nutrition of cereals on infection by *Erysiphe graminis* D.C.]—*Wiss. Arch. für Landw., A, Pflanzenbau*, iii, pp. 371–388, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 15–22, p. 459, 1930.]

The susceptibility of cereals to mildew (*Erysiphe graminis*) is stated to be increased by unbalanced applications of nitrogen on the one hand and a deficiency of potash on the other, and to be reduced by phosphoric acid which accelerates the development of the plants [cf. *R.A.M.*, ix, p. 473]. There is a risk, however, that this 'spurious' immunity may be unable to withstand the great adaptability of the *Erysiphe* forms to new nutritional conditions in the host. No case of genuine immunity from mildew has been observed among cereal varieties in Germany, and at present the sole promising measure of control (apart from sulphur treatment) is the cultivation of varieties resistant to the particular forms of the fungus occurring in a given locality.

GORDON (W. L.). **Effect of temperature on host reactions to physiologic forms of Puccinia graminis avenae Erikss. & Henn.**—*Scient. Agric.*, xi, 2, pp. 95–103, 1 fig., 1930.

In this account of investigations conducted at the Dominion Rust Research Laboratory, Winnipeg, into the effects of temperature on the reactions of the differential varieties of oats to physiologic forms of *Puccinia graminis avenae*, it is stated that no significant deviations from the normal reactions of White Russian, Richland, and Victory oats to any of the physiologic forms occurred at 57·4°, 64·8°, 71·9°, and 75·4° F. The effect of temperature on the reactions of all the differential hosts to physiologic forms 2, 6, 7, and 8 under the experimental conditions was negligible.

Change of temperature did, however, decidedly affect the reaction of 'Joanette Strain' [*R.A.M.*, ix, p. 435] to forms 1, 3, 4, and 5. At 57·4° it reacted normally, but at the higher temperatures its reactions were heterogeneous and abnormal. It was extremely resistant to physiologic form 4 at 57·4°, but completely

susceptible to it at 75·4°. It also gave a very heterogeneous reaction to forms 1, 3, 4. and 5 when the temperature at which it was kept during the development of the rust was changed. The longer it was kept at 60·8° during the development of the rust before it was transferred to 76·8° the greater was its resistance; conversely, the longer it was kept at 76·8° before being transferred to 60·8° the greater became its susceptibility. When maintained at 60·8° during the complete development of the rust it was resistant to forms 1, 3, and 4; but kept at 76·8° for the same period it was susceptible or heterogeneous in its reaction. It gave the normal heterogeneous reaction to form 5 when kept at 60·8°, but was susceptible to it at 76·8°.

These results indicate that the fluctuations frequently observed in the reaction of Joanette Strain in greenhouse tests to physiologic forms 1, 3, 4, and 5 of *P. graminis avenae* are partly to be explained by fluctuations in the greenhouse temperature. It is thought that different intensities of light may also be a factor.

PETURSON (B.). **Effect of temperature on host reactions to physiologic forms of Puccinia coronata avenae.**—*Scient. Agric.*, xi, 2, pp. 104–110, 1930.

A full account is given of experiments at Winnipeg to ascertain the influence of temperature upon the rust reactions of the six differential oat varieties, viz., Green Mountain C.I. 1892, White Tartar C.I. 551, Green Russian (Iowa 96), Red Rustproof C.I. 1039, Sterilis Selection, and Ruakura Rustproof C.I. 2025 to physiologic forms 1, 3, 4, and 7 (this last form has not previously been reported) of crown rust (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, ix, p. 371], and to determine the effect of temperature on the formation of the teleutosori.

Cultures of all four forms were incubated at 57°, 70°, and 77° F. Form 1 developed normally on all the differential varieties at these temperatures. The rate of rust development on seedlings kept at 57° was retarded by about two days as compared with the rate on those kept at 77°, but the final rust reactions to this form were identical. No teleutosori of form 1 were produced. The reactions to form 3 were not appreciably affected by temperature, but rust development was slower at the lowest temperature than at the others, the former also retarding the appearance of the teleutosori. At 77° teleutosori began to form after about 12 days, but at 57° they did not appear until after about 22 days. All the differential hosts except Red Rustproof reacted identically at the three temperatures to form 4. At 70° and 77° Red Rustproof was highly susceptible, but at 57° moderately resistant. At 57° no teleutosori appeared, but at the higher temperatures they formed abundantly after about three weeks. All the varieties were completely susceptible to form 7 at 77°; at 70° Green Mountain, White Tartar, and Green Russian were very resistant, while at 57° they remained almost unaffected. The remaining varieties were wholly susceptible to form 7 at all three temperatures, but rust development was retarded at the lowest temperature; no teleutosori were produced.

Green Mountain and White Tartar seedlings when inoculated with form 7, kept up to four days at 77°, and then transferred to

57°, were resistant. When seedlings of the same two varieties were infected with form 7, kept up to four days at 57°, and then transferred to 77°, they rusted heavily. When they were inoculated and kept at 77° during the day and at 57° for 12 hours each night during the period of rust development, they were highly resistant.

Emphasis is laid upon the importance of keeping the greenhouse temperature uniform (at about 70°) when the physiologic forms of the rusts are being identified; in recording the reactions of physiologic forms of crown rust of oats, investigators should state at what temperature the differential hosts were kept while the rust developed.

TERÉNYI (A.). **Biochemie der Brandkrankheiten der Getreidearten. III. Mitteilung. Über die Kupferadsorption der Haferflugbrandsporen (Ustilago avenae [Pers.] Jens.).** [Biochemistry of the smut diseases of cereals. Note III. On the copper adsorption of the spores of loose smut of Oats (*Ustilago avenae* [Pers.] Jens.).—*Hoppe-Seyler's Zeitschr. für Physiol. Chem.*, cxcii, 4–5–6, pp. 274–280, 4 graphs, 1930.

The results [which are discussed and tabulated] of the writer's investigations on the adsorption of copper from solutions of copper sulphate, copper acetate, and copper ammonium sulphate by the spores of loose smut of oats (*Ustilago avenae*) indicated that the quantity of copper taken up by the spores of this smut exceeds that adsorbed by those of wheat bunt [*T. caries*: *R.A.M.*, ix, p. 444] by 1·2 to 50 per cent. The oat smut spores, however, are much less sensitive to the adsorbed copper than are those of wheat bunt, 3 per cent. of the mineral being required to inhibit germination in the former case compared with only 0·5 per cent. in the latter. Like the bunt spores, those of *U. avenae* regain their viability after treatment with hydrochloric acid to wash away the copper; this process is effective, however, only where the disinfection period does not exceed 15 minutes, and failed to revive the spores subjected to 24 hours' immersion in copper acetate or copper sulphate. In the latter case the copper evidently penetrates to the interior of the spores. Immersion for 15 minutes in copper ammonium sulphate (0·25 to 2 per cent.) completely killed the oat smut spores.

STANTON (T. R.), COFFMAN (F. A.), TAPKE (V. F.), WIEBE (G. A.), SMITH (R. W.), & BAYLES (B. B.). **Influence of hulling the caryopsis on covered-smut infection and related phenomena in Oats.**—*Journ. Agric. Res.*, xli, 8, pp. 621–633, 1930.

This report presents a condensed summary of the results obtained by the authors, working in five localities of the United States widely differing from each other in their climatic and ecological conditions, in their study of the influence of dehulling oat seed grain on the incidence and development of infection with covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, viii, p. 438 and next abstract]. The material tested consisted of ten oat varieties, 200 pure line selections of the unnamed variety C.I. No. 357, and several hundred selections from seven different crosses. In sus-

ceptible varieties dehulling the caryopsis before inoculation with the fungus increased the percentage of smutted plants, on a general average, from 35·2 to 63·8 per cent. In hybrid selections of these varieties with the smut-immune Markton oat [ibid., iv, p. 87], the number of smutted plants was increased by this operation from 3·8 to 12·8 per cent., and in selections from C.I. No. 357 from 2·5 to 16·7 per cent. Of 112 lines of this variety which remained free from infection in 1925 though partly hulled, 44 were infected with *U. kolleri* in the 1926 experiments when all the seed was hulled.

A limited series of experiments at Moro, Oregon, in 1926, showed that in three varieties dehulling reduced the number of seedlings emerging from clean seed by 6·5 per cent., and from seed inoculated with *U. kolleri* by 11·2 per cent. It is pointed out, however, that the effect of dehulling on the emergence of the seedlings varied considerably with the variety, and that the operation appeared to reduce the number of seedlings slightly more than the smut did. It was also observed that in Markton, which so far always gave evidence of complete immunity from the smut in the field, the seedling emergence was reduced by 2·9 per cent. through inoculation of the seed with the smut, a fact which would tend to indicate that this variety is not entirely immune. The average percentage of plants reaching maturity in all the tests was 54·7 for the dehulled and 61·8 for the non-dehulled seed. Hulling had a marked effect on the infection of certain F_3 hybrids, and the authors consider that without developing inoculation methods ensuring complete infection it will not be possible to interpret satisfactorily the results of studies on the inheritance of smut resistance.

LODS (E. A.) & COULSON (J. G.). **A preliminary report on size of seed in relation to smut infection in Oats.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 80–85, 1929. [Received November, 1930.]

An account is given of field and greenhouse tests conducted at the Macdonald College, Quebec, from 1924 to 1927, to ascertain whether a relation could be established between the size of oat seed and the amount of loose and covered smut [*Ustilago avenae* and *U. kolleri*] developing on the seedlings after artificial seed inoculation. The varieties used were Banner 4707 M.C., Alaska 412 M.C., both of the *Avena sativa* group, and Liberty (0·480), a hull-less oat of the *A. nuda* group. The seed was dehulled, a certain amount of Banner 4070 M.C., being, however, retained with hull for comparative purposes.

In field experiments large seed of Banner (with and without hull), Alaska, and Liberty oats inoculated with covered smut yielded, in 1924, 2·01, 19·11, 10·95, and 40·84 per cent. infected plants, respectively, while small seed gave 1·75, 35·46, 40·74, and 66·14 per cent., respectively. Large seed infected with loose smut gave percentages, in 1926, of 6·86, 85·93, 37·04, and 75·83, respectively, while small seed gave 12·66, 81·82, 65·69, and 93·47, respectively. Results in 1925 with covered smut and in 1927 with loose smut were generally similar as were also greenhouse tests

(in which Banner without hull was omitted) with both smuts. There was, therefore, a marked increase in the amount of infection present in plants from naked as compared with those from covered seed of the Banner variety, no matter whether large or small seed was used [see preceding abstract]. Further, seedlings from small seed are unquestionably more susceptible to infection by *U. avenae* and *U. kolleri* than are those from large seed, and the authors consider that, in certain seasons, good grading may be an important factor in disease control.

KOEHLER (B.) & HOLBERT (J. R.). **Corn diseases in Illinois: their extent, nature, and control.**—*Illinois Agric. Exper. Stat. Bull.* 354, 164 pp., 5 col. pl., 66 figs., 1 graph, 4 maps, 1930.

This is a very comprehensive account of the diseases of maize in Illinois, the annual losses from which are conservatively estimated at over 20 per cent. of the crop. Surveys indicate that the probable loss from seedling diseases (chiefly *Diplodia zeae*, *Gibberella saubinetii*, *Fusarium moniliforme* [*G. moniliformis*], and *Basisporium gallarum* [*Nigrospora sphaerica*: *R.A.M.*, ix, pp. 374, 712, 773, *et passim*]) is 9 per cent.; from black bundle (*Cephalosporium acremonium*) [ibid., ix, p. 579] 3 per cent.; smut (*Ustilago zeae*) 3 per cent.; root rots (*Pythium arrhenomanes* [ibid., ix, p. 561] and malnutritional) 5 per cent.; stalk rots (*Pseudomonas* [*Bacterium*] *dissolvens*, *D. zeae*, and other organisms) 2 per cent.; and ear rots (*D. zeae*, *G. saubinetii*, *G. moniliformis*, *N. sphaerica*, *Penicillium oxalicum* [ibid., viii, p. 377], *Aspergillus* and *P.* spp. in storage, and miscellaneous non-parasitic causes) 7 per cent. Other diseases discussed in this bulletin are bacterial wilt (*Aplanobacter stewarti*) [ibid., viii, pp. 98, 157], scutellum rot [ibid., ix, p. 579], and various leaf injuries, e.g., rust (*Puccinia sorghi*), brown spot (*Physoderma zeae-maydis*), leaf blight (*Helminthosporium turcicum*), and *Holcus* bacterial spot (*Bact. holci*), none of which is of great importance under average conditions in Illinois. Suggestions are made for the control of the diseases by sanitary measures and seed treatment.

A bibliography of 121 titles is appended.

RANKER (E. R.). **The nature of smut resistance in certain selfed lines of Corn as indicated by filtration studies.**—*Journ. Agric. Res.*, xli, 8, pp. 613–619, 3 figs., 1930.

With a view to investigating the nature of the resistance to smut (*Ustilago zeae*) exhibited by certain selfed lines of maize [*R.A.M.*, viii, pp. 166, 427], the effect was studied of the filtrates from the juices extracted [by a method which is described] from the stalks, leaves, and husks [ear sheaths] of susceptible and resistant lines of maize on the germination and subsequent growth of the spores of the pathogen. The results indicated that the resistance of certain lines is due to the presence in their tissue juice of a soluble substance that inhibits the growth of the fungus, and which was not found in the juice of any part of any of the susceptible lines tested. In some of the resistant lines (e.g., Silver King No. 67) the juice which exerted the most inhibiting effect was that of the husks, while in others (e.g., Salmon Silk No. 14)

it was that of the leaf tissues. A few smut-resistant lines failed, however, to show any inhibiting effect, this being interpreted to indicate the existence of other types of resistance due to some other factors not yet determined.

An interesting feature of the investigation was the constancy of the inhibitory effect on all the six strains of *U. zeae* tested, regardless of differences in physiological forms and virulence of the strains, which originated from widely separated localities in the United States.

BUCHHEIM (A.). **Einfluss von Ustilago panici-miliacei auf Entwicklung und Wachstum der Wirtspflanze.** [Influence of *Ustilago panici-miliacei* on the development and growth of the host.]—*Zeitschr. für Bot.*, xxiii (*Festschr.*), pp. 245–250, 2 figs., 1930.

Inoculation experiments [which are briefly described] conducted in 1929 at the Moscow Agricultural Academy with *Ustilago panici-miliacei* on *Panicum miliaceum* var. *subaureum* [*R.A.M.*, ix, p. 449] showed that the number of stalks and leaves is larger on diseased than on healthy plants. The average increase in the number of stalks of infected as compared with healthy individuals was from 2·06 to 2·53 and that of leaves from 7·026 to 10·05 [cf. ibid., vii, p. 162], both of which differences are considerably greater than the statistical limits for significance.

MITTER (J. H.) & TANDON (R. N.). **A note on Sclerospora graminicola, (Sacc.) Schroet. in Allahabad.**—*Journ. Indian Bot. Soc.*, ix, 4, p. 243, 1930.

Sclerospora graminicola occurred in a severe form on *Pennisetum typhoideum* in some low-lying fields near Beli Road, Allahabad, during 1930, the average incidence of infection in three fields amounting to about 45 per cent. [*R.A.M.*, ix, p. 506]. No grain was produced by the infected plants, every ear of which was transformed into a loose, green head mostly composed of small, twisted leaves. Except in low-lying localities *P. typhoideum* was relatively free from attack by *S. graminicola*, showing the importance of avoiding such sites for the cultivation of this crop.

PETRI (L.). **Lo stato attuale delle ricerche sul 'mal del secco' dei Limoni.** [The present state of researches on 'mal secco' disease of Lemons.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 1, pp. 63–107, 2 col. pl., 5 figs., 1930.

In this paper, which is based on all the information available at the time of writing, a full account is given of the 'mal secco' disease of lemons (*Deuterophoma tracheiphila*) [see next abstract] in Italy. The symptoms are described [*R.A.M.*, ix, p. 300] and compared with those of other citrus diseases, and a list is given of susceptible and resistant species, the former comprising the common lemon, the sour orange, and the citron (*Citrus medica*), while the sweet orange (*C. aurantium*) and mandarin (*C.* [*nobilis* var.] *deliciosa*) are resistant. No information is as yet available regarding the susceptibility of *C. maxima*. The geographical distribution of the disease in Europe is Sicily, Catania, Galata in Greece, and the islands of the Aegean.

The earliest observation of 'mal secco' appears to have been made in the island of Chios in 1894 when a heavy destruction of lemons occurred. Galata was infected by 1900 and the plantations had to be reconstructed in 1915. In Crete citrons are severely attacked. The recent discovery of the disease in Palestine [ibid., ix, p. 645] and the chronological sequence of its appearance in the Aegean, Peloponnesus, and Sicily suggest that it originated in Asia and spread from east to west.

The pathological processes involved in the tracheomycosis and the anthracnose (*Colletotrichum gloeosporioides*) are dealt with in detail, the cultural characters of both *D. tracheiphila* and *C. gloeosporioides* being described. Notes are also given on the meteorological and soil conditions thought to favour the disease [ibid., viii, p. 547] and the author's successful attempts to reproduce it artificially [ibid., ix, p. 522] are described in detail. Attempts to secure infection through the leaves of the bitter orange, by means of pycnospore suspensions in moist cotton wool kept enclosed with the leaf in a glass tube, were successful in some cases, and the fungus was recovered from the vessels of the midrib after three or four weeks. The control of 'mal secco' by improving the powers of resistance of the trees and by preventive measures are also discussed.

PETRI (L.). **Ulteriori ricerche sulla morfologia, biologia e parassitismo della 'Deuterophoma tracheiphila'.** [Further researches into the morphology, biology, and parasitism of *Deuterophoma tracheiphila*.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 191–221, 13 figs., 1930.

After describing the mode of formation of the pycnidia of *Deuterophoma tracheiphila* [*R.A.M.*, ix, p. 645] in culture, the author states that many of the cells in the centre of the pycnidium remain sterile and are the first to undergo autolysis, thus forming cavities in which the pycnospores are produced. The spores originate in a protrusion from one side of a sporogenous cell, which grows out into an elongated sterigma; this swells at the tip to form the pycnospore. The mother cells are plurinucleate, a single nucleus passing into each spore. Spore formation is very rapid and can be repeated several times by each cell. The peridial layer becomes differentiated after the formation of the pycnospores has begun. The peridial cells differ from the conidiophores only in the dark colour of their wall, their scantier contents, and the fact that they are not plurinucleate. There is no apical ostiole nor is there any thickening of the wall on the free side of the pycnidium. In the pycnidia formed in culture the thickening and coloration of the peridium are more marked on the outer side than on that which is immersed in the stroma. The gelatinization of the cells in the interior of the peridial cavity provides a substance (which swells in water) in which the spores are immersed, the release of the latter being rendered possible when the pycnidia are wetted by rain or dew. The pycnospores are thus disseminated only after a certain time has elapsed.

Because of the non-branched conidiophores which arise as lateral branches from a hypha, and because of the single, hyaline, elongated,

terminal conidia, the author considers that the conidial fructifications of *D. tracheiphila* belong to the *Acremonium* type; in culture conidiophores are sometimes seen which can be referred to *Botrytis*, consisting of short, simple or septate lateral branches, with the formation of one to three terminal conidia; an indentation for the insertion of the conidium at the tip of the conidiophore also brings this type of fructification near to certain forms of *Botrytis*. As the pycnidia develop, conidial production ceases, or nearly so; when conidial formation is very active, as at 25° to 26° C., few or no pycnidia are produced.

In culture the conidia vary considerably in size, the limits of variation remaining constant for each race or strain of the fungus. A non-chromogenic strain isolated by H. S. Fawcett in Palestine [loc. cit.] produced conidia measuring 2·5 to 8·2 by 0·8 to 2·9 μ, though the conidia of the chromogenic strain found in Sicily measure only 2·5 to 4 by 0·8 to 1·8 μ. A non-chromogenic strain found in Greece also forms larger conidia than does the chromogenic Sicilian strain, while the chromogenic strain found by Reichert in Palestine [loc. cit.] produces conidia similar in size and shape to those of the Sicilian strain.

The conidiophores are usually somewhat olivaceous-brown at the base and always hyaline at the tip. The aerial hyphae are also olivaceous-brown and tend to form into bundles 3 to 5·5 μ in diameter. The immersed hyphae are generally hyaline and often change suddenly in diameter with the development of a segment at the tip. The conidia, which have not been found in nature, are thought to have particular importance in the propagation of the fungus in its saprophytic life in the soil.

Cultures of the Palestinian strains isolated by Fawcett and Reichert, when transferred to carrot agar at 25° to 26°, developed a mycelium deep brown both on the surface and in the aerial hyphae; conidial formation was very active but no pycnidia were produced. In Fawcett's strain the conidia reached 8 μ, but in Reichert's they never exceeded 6 μ. Marked differences appeared in the strains after a few days at 15° to 18°. In Fawcett's strain a whitish-grey superficial mycelium bearing pycnidia developed round a central aggregation of grey aerial hyphae, whereas in Reichert's strain when the pycnidia began to form, the mycelium surrounding a central hyphal mass became sealing-wax red. No pigmentation was formed at temperatures over 24°. On meat peptone-agar, which is very favourable to the production of this pigmentation, Fawcett's strain never showed this coloration, although Reichert's strain rapidly produced it in abundance; further, Fawcett's strain did not liquefy gelatine, though Reichert's strain, like the Sicilian chromogenic strain, did so rapidly. This inability in the non-chromogenic Palestinian strain to form proteolytic enzymes appears to accord with the weaker pathogenicity of the (identical) non-chromogenic Greek strain.

Neither in the Palestinian nor the corresponding European strains were substantial differences observed in the pycnidia, apart from the larger pycnidial dimensions of the non-chromogenic race; the dimensions and shape of the pycnospores were identical. The non-chromogenic race was not found in Sicily.

On solid and liquid media the mycelium of *D. tracheiphila* grows at temperatures ranging from 10° to 28°; beyond these limits growth is very slow, and it becomes arrested at 6° and 30°. Conidia are produced at from 12° to 28° but the pycnidia form only between 12° and 24°. When the cultures are kept at laboratory temperature the superficial mycelium in cold weather is snow-white, turning grey or slightly olivaceous only when old; numerous pycnidia are produced. In summer, however, the mycelium is olivaceous- or blackish-brown, and pycnidial production ceases. Low temperatures appear to favour the production of hyphae rich in red colouring-matter.

Actively growing cultures showed no further development when transferred to temperatures of 30° to 40°; after being kept for 10 days at these temperatures and then placed in a temperature of 18° only those at 30° resumed growth.

In nature, infection becomes arrested during the summer; no new infections take place, the mycelium ceases its progress down the tree, and the vessels containing mycelium as well as the adjacent ones become filled with gum which in some instances gives reactions like lignin. Similar results were obtained in artificial infection experiments.

All attempts to demonstrate the penetration of the mycelium through the leaf stomata were unavailing. Before germination the pycnospores may increase ten times in diameter, and the germ-tube is more than twice the maximum diameter of the stomatal apertures. As, however, some of the hyphae scarcely exceed 1 μ in diameter, stomatal penetration is not regarded as impossible. It is more probable, though, that the spores are simply carried passively by the wind into the stomata. The mycelium was found in the median, secondary, and tertiary veins of the leaf blades, and in the intercellular spaces of the spongy tissues, but that it had not spread from the branch was invariably indicated by tracing the gradual disappearance towards the base of the branch of the orange discoloration in the vessels. It is also pointed out that the stomata in the leaves of lemon (susceptible to mal secco) and mandarin [*Citrus nobilis* var. *deliciosa*] (resistant) are of approximately the same size as those in the leaves of the susceptible bitter orange [*C. aurantium*], while in the resistant sweet orange the stomata are much larger. The resistance of mandarins and sweet oranges cannot, therefore, be attributed to the anatomical features of the epidermis.

CHABROLIN (C.). **Les maladies du Dattier.** [Diseases of the Date palm.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, x, 107, pp. 557–566; 108–109, pp. 661–671, 1 pl., 1 fig., 1 map, 1930.

After a full account in semi-popular terms of the 'bayoud' disease of date palms (*Phoenix dactylifera*) in Northern Africa [*R.A.M.*, x, p. 99] and the much less serious but more prevalent inflorescence rot or 'khamedj' caused by *Mauginiella scaettae* [ibid., ix, p. 239], the author gives notes on *Graphiola phoenicis* [ibid., iv, p. 190] and on various other fungi occasionally found on the same host, including the *Diplodia* isolated by Fawcett in California [ibid., viii, p. 550], *Sterigmatocystis phoenicis*, and *Macrosporium*

sp., *Alternaria* sp., and *Helminthosporium* sp. [ibid., ii, p. 154; v, p. 82]; reference is also made to the successful inoculation of date palms with *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., vii, p. 630]. A bibliography of over 30 titles is appended.

KLOTZ (L. J.) & RABY (E. C.). **A disease of Date Palm inflorescences.**—Abs. in *Phytopath.*, xx, 10, pp. 852–853, 1930.

A potentially serious disease of date palm inflorescences, observed on a single palm in the Coachella Valley of California, is characterized by circular to elongated, sorghum-brown (Ridgway) lesions on the exterior surface of the spathe and sorghum-brown to mahogany-red or bay spots on the interior surface, and depressed, dark brown to black, necrotic, circular to oblong areas on the fruit stalks. The twisted, deformed rachids were blackish-brown to black and devoid of flowers and were found, on microscopic examination, to be covered with dark brown, unicellular, oval conidia. The rachids of fruit bunches attacked at a later stage of development showed blackened, sunken lesions similar to those on the fruit stalk, and some were completely severed by the decay. The diseased tissue was dry and firm, and each affected area bore black, powdery spores. A grey covering on some of the lesions was found to be due to conidia of *Fusarium* spp. [*R.A.M.*, ix, p. 649].

The disease under discussion has certain features in common with the 'khamedj' disease of dates in Northern Africa, caused by *Mauginiella scaettae* [see preceding abstract], but the white, tomentose covering of the latter fungus is absent in the Californian malady. From the internal tissue of material collected at Indio a species of *Thielaviopsis* was consistently isolated. The senior author has also found the same organism associated with the bud scorch and 'fool' diseases of date palms.

BRITON-JONES (H. R.). **Control of the American leaf disease (Omphalia flavida) on Arabian Coffee in Trinidad.**—*Mem. Imp. Coll. Trop. Agric. Trinidad, Mycol. Ser.* 2, 8 pp., 1930.

The American leaf disease (*Omphalia flavida*) of coffee [*R.A.M.*, ix, p. 437] is stated to have spread in recent years in the island of Trinidad [ibid., vii, p. 305], where it is now attracting considerable attention owing to the heavy losses caused by it to plantations of Arabian coffee in the Northern Range; it has also been observed severely attacking Robusta coffee, which is, however, but little cultivated in that part of the island, and sporadic outbreaks have also been found at lower elevations. Observations on the distribution of the disease lead the author to agree with Nowell [ibid., v, p. 736] that it is closely dependent on humid conditions; the evidence in Trinidad indicates, however, that high atmospheric humidity is more important than total rainfall, prolonged mists appearing particularly to favour the incidence and spread of infection.

Control by spraying with 2 per cent. Bordeaux mixture was ineffective in one experiment, but the author considers that apart from efficacy, the type of labour available and costs make this method impossible in practice in Trinidad. The best results were obtained by heavy pruning, though not so drastic as to cause a

serious set-back to the bushes, together with complete removal of the leaves, manuring, and cultivation to induce vigorous growth. In one plot of 400 bushes complete control was obtained by this method, the prunings being left to rot in the plantation, and though the bushes did not set a crop in the following season, prospects are stated to be good for 1931. Since bearing in alternate years is a character of coffee bushes the pruning is recommended for every other year.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Studies on the overwintering of Phymatotrichum root rot.**—*Phytopath.*, xx, 10 pp. 761–785, 2 figs., 2 diags., 1930.

This is a comprehensive account of the authors' studies on the mode of hibernation of the causal organism of cotton root rot (*Phymatotrichum omnivorum*) in Texas [*R.A.M.*, ix, p. 716].

P. omnivorum was found to be viable on overwintered living, infected cotton roots but not on diseased decayed ones. Cotton plants were successfully inoculated from tap-roots of plants that had succumbed to root rot up to two weeks previously, but not after three weeks. Root rot survives on the roots of many other plants besides cotton.

Large numbers of sclerotia were found on newly infected cotton plants in fields apparently free from overwintered roots, thus confirming the work of King and of Loomis and Neal [ibid., ix, p. 306]. These organs were also produced in soil chambers in the laboratory and in cultures on synthetic media. The sclerotia germinate readily, and the same individuals may renew growth at least five times under laboratory conditions. Cotton plants were successfully inoculated with a pure culture isolated from a sclerotium and with growth from sclerotia placed directly in the soil, and new sclerotia developed in these containers.

The microscopic examination of *Phymatotrichum* spore mats from the field revealed the actual continuity of the spore-bearing hyphae of the mats with the typical subterranean *Ozonium* growth. Low percentages of germination have been obtained with the spores, but no successful growth or infection from them has yet been secured. A *Hydnum* often associated with plants killed by *Phymatotrichum* root rot [ibid., iv, p. 637], does not resemble the latter in pure culture, and no definite connexion between the two has yet been traced.

EZEKIEL (W. N.), TAUBENHAUS (J. J.), & CARLYLE (E. C.). **Soil-reaction effects on Phymatotrichum root rot.**—*Phytopath.*, xx, 10, pp. 803–815, 1 fig., 1930.

In a series of experiments [details of which are given] in which cotton plants inoculated with *Phymatotrichum omnivorum* [see preceding abstract] were grown in soils of varying hydrogen-ion concentrations, the percentages of infection and of plants killed by the disease were higher in soils with alkaline reaction. In acid soils fewer plants were attacked; the average interval between inoculation and wilting was slightly longer; and root rot spread more slowly and less far than in neutral or alkaline soils. A marked diminution of root rot occurred at about P_H 6 while none

was present with the soil at P_H 5 to the bottom of the containers, but there was still some in containers with a very acid surface and a slightly alkaline subsoil. The causal organism also overwintered successfully in such containers.

Preliminary tests in the control of cotton root rot by means of sulphur were conducted in the laboratory and in field plots, only the surface layer being acidified in both cases. The incidence of root rot was reduced by applications of sulphur at 5,000 and 10,000 lb. per acre, but not eliminated even with surface soil as acid as P_H 3·4 when the acidity extended only to depths of 3 to 6 inches. Acid injury occurred in surface soils adjusted to P_H 2 to 4 even with a neutral or alkaline subsoil. Serious difficulties, therefore, must be overcome before this method of treatment can be generally applied for the control of root rot.

KIRKPATRICK (T. W.). **Preliminary note on leaf-crinkle of Cotton in the Gezira area, Sudan.**—*Bull. Entomol. Res.*, xxi, 2, pp. 127–137, 1930.

This is a full account of the experiments on which the author based his statement that leaf curl or crinkle of cotton is mainly, if not exclusively, transmitted in the Sudan by whiteflies (Aleurodidae) [*R.A.M.*, ix, p. 590 and next abstract]. Hitherto all attempts to transmit crinkle (which is believed to reduce the number of bolls set by each plant, as well as the number of seeds per boll) by the following methods have failed: scratch inoculations on old and young leaves and stems with the expressed juice of diseased plants; rubbing the leaves of healthy plants with crinkly leaves; and insertion of fresh crinkly tissue into healthy stems. General evidence having been obtained that insects were responsible for the transmission of the disease, experiments were conducted under controlled conditions with *Empoasca fascialis*, the only member of the Jassidae commonly occurring in the Sudan, and with an undetermined species of whitefly. The tests with the former insect gave negative results, while eight out of nine cotton plants grown under glass and muslin in water cultures on which whiteflies from crinkly cotton were placed developed the disease in 13 to 32 days; in two cases the symptoms were quite as severe as those occurring in the field. The remaining plant showed no symptoms of crinkle in 27 days but developed them on the new growth ten days after the removal of the growing point. None of the eight controls, grown in cultures from which whiteflies were excluded, developed a trace of crinkle.

It is concluded from these studies that whiteflies are probably the sole vectors of crinkle. A number of transmission experiments with flea-beetles (*Nisotra uniforma*) gave negative results, and even if aphids act as subsidiary carriers, they cannot be responsible for the main spread of the disease, since they are practically non-existent on cotton in the Gezira until late in the season.

Observations [which are tabulated] on the spread of crinkle at the Gezira Research Farm indicate that a plant may develop the disease in a severe form within three weeks from the first detection of the symptoms. The time of sowing appears to exert some influence on the intensity of the crinkle symptoms and also on the

date of their appearance, the period elapsing between sowing and the development of 75 per cent. infection being 85, 151, and 136 days for seed sown on 15th August, 5th October, and 22nd October, respectively. It is hardly possible as yet, however, to draw any definite conclusion from these preliminary trials.

The symptoms of leaf crinkle have also been observed on *Hibiscus esculentus* and *H. cannabinus*.

AFZAL HUSAIN (M.). **Leaf-curl in Cotton.**—*Nature*, cxxvi, 3190, p. 958, 1930.

Referring to Kirkpatrick's statement that leaf curl or crinkle of cotton in the Sudan is transmitted mainly by an undetermined species of whitefly (Aleurodidae) [see preceding abstract], the writer reports the constant occurrence of another member of this family, *Bemisia gossypiperda*, in immense numbers on cotton in the Punjab. This insect, however, causes no malformation of the infested leaves even under controlled conditions in cages, whereas the jassid, *Empoasca devastans*, is considered to be definitely responsible for a form of leaf crinkle.

AVERNA-SACCA (R.). **Os entomophagos cryptogamicos na broca do Cafeeiro (Stephanoderes hampei Ferr.) encontradas em S. Paulo.** [The entomogenous fungi observed on the Coffee berry beetle borer (*Stephanoderes hampei* Ferr.) in San Paulo.] —*Bol. Agric. São Paulo*, xxxi, 1–2, pp. 10–24; 3–4, pp. 195–213, 12 figs., 1930.

After a general review of present knowledge concerning the activity of entomogenous fungi in the control of insect pests of economic crops, the author gives notes on the occurrence in San Paulo, Brazil, of *Botrytis stephanoderis* [*Beauveria bassiana*: *R.A.M.*, v, p. 427; ix, p. 454] and *Botrytis rileyi* [? *Spicaria prasina*: ibid., v, p. 97; vi, p. 229] on the coffee berry beetle borer (*Stephanoderes hampei*).

Beauveria bassiana is characterized by globular, hyaline microconidia (2·5 to 4 μ in diameter) and ovoid, unicellular macroconidia (14 to 36 by 11 to 18 μ) borne on small lateral sterigmata. The latter are sometimes accompanied by the oval to elliptical, hyaline, uniseptate macroconidia of a species of *Sporotrichum*. Both the micro- and macroconidia of the fungus are produced in immense numbers, the former being disseminated by wind, dew, and insects, and germinating on the body of the coffee berry beetle borer under conditions of protracted humidity and heat. The germ-tubes penetrate the insect through its natural apertures, and the mycelium spreads through the internal organs and destroys them either by mechanical action or by the production of solubilizing enzymes. From the interior of the insect the hyphae spread outwards and cover the outer part with a white efflorescence. Some of the hyphae produced in the internal organs exceed in diameter those formed externally (7 to 7·5 μ). After the insect is dead and its interior consumed the fungus passes from the parasitic to the saprophytic state, in which it continues to form microconidia ready for germination under favourable conditions. Conidia produced by *B. bassiana* on *Apate tenebrans* in September, 1928, were found

to be still capable of infecting *Stephanoderes hampei* in January, 1929, i. e., after 120 days.

Attention is drawn to the frequent occurrence, in company with *B. bassiana*, both in nature and culture, of a bacterium which is thought to be connected in some way, as yet unexplained, with the biology of the fungus. Some of the insects killed by artificial inoculation with the spores and mycelium of *B. bassiana* showed no trace of the typical efflorescence mentioned above.

Botrytis rileyi, isolated from *A. tenebrans*, feeding on *Melia azedarach*, is characterized by a mycelium resembling that of *Beauveria bassiana*, hyaline, globular or oval microconidia (2 to 3·5 μ), and occasional macroconidia and chlamydospores. The author is of opinion that the two fungi under discussion are probably identical. The pathogenicity of *Botrytis rileyi* to *S. hampei* was demonstrated by dusting conidia of the fungus over the insects, which died after three to four days' incubation in a moist chamber. Subsequently the writer succeeded in transmitting infection to coffee berry beetle borers by placing them in contact with berries previously parasitized by diseased insects. Similar results were obtained with *Beauveria bassiana*. It is pointed out, however, that the protracted humidity and heat essential to the development of these fungi are seldom encountered in nature.

HIGHMAN (W. J.). **Epidermophytosis and epidermophytids of the hands.**—*Journ. Amer. Med. Assoc.*, xcv, 16, pp. 1158–1160, 1930.

Referring to the views of Peck and others on epidermophytids of the hands as a sequel to epidermophytosis of the feet [*R.A.M.*, x, p. 29], the writer reports the case of an American woman who suffered for three years from a generalized eczematous eruption and finally developed a dysidrosis confined to the hands. Only one of the nummular, vesicular lesions was found to contain fungal elements. The epidermophytids on the hands apparently arose direct from the latter and not as a sequel to foot infection. The paper was followed by a discussion of which an abstract is given.

PETRAK (F.). **Über eine neue Amaryllis-Krankheit.** [On a new *Amaryllis* disease.]—*Gartenbauwissensch.*, iii. pp. 74–78, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 8–14, p. 272, 1930.]

Amaryllis plants cultivated by the author [in Czecho-Slovakia] were attacked by *Stagonospora crini* Bub. et Kab. [*R.A.M.*, ix, p. 595], which produced spherical to elongated, carmine spots on the leaves and floral shoots, involving the partial decay or shrivelling of the latter. The bulb scales also shrivel or rot, mostly from the top downwards. The pycnidia of the fungus, which develop below the epidermis of the leaf under persistently humid conditions, measure 120 to 200 μ in diameter, the 2- to 5-septate macroconidia, 16 to 26 by 5 to 8 μ, and the non-septate microconidia formed in many of the pycnidia, 7 to 12 by 3 to 5 μ. All infected material should be promptly removed and cut surfaces of leaves and bulbs dried with charcoal dust. *Zephyranthes rosea* proved susceptible to infection by *S. crini* in inoculation tests.

Phyllosticta gemmipara [*R.A.M.*, viii, p. 649] is believed to be merely an ill-developed form of *S. crini*.

LAUBERT (R.). **Blattfleckenkrankheit der Akelei.** [Leaf spot disease of Columbine.]—*Gartenwelt*, xxxiv, 45, p. 621, 1 fig., 1930.

The causal organism of a columbine (*Aquilegia vulgaris*) disease characterized by large, circular, bluish-black to brownish-black spots on the leaves was identified as *Ascochyta aquilegiae*, the hyaline, elongated, non- or uniseptate, occasionally biseptate spores of which measure 11 to 18 by 4 to 6 μ. The fungus overwinters on the diseased leaves, which should therefore be collected and destroyed in the autumn. The leaf spot of columbines appears to be favoured by damp weather, and during the summer of 1930 it was very prevalent in the vicinity of Berlin.

CHESTER (K. S.). **Graft-blight of Lilac.**—*Journ. Arnold Arboretum*, xi, 4, pp. 232–233, 1930.

Lilac (*Syringa vulgaris*) bushes in New England, New York, and New Jersey have been observed to suffer severely from a disease which the writer terms 'graft blight', characterized by progressive yellowing of the leaf margins and intervenous spaces, reduction in the size and number of leaves, brittleness and curling of the foliage, and premature or abnormally late leaf fall, resulting in general dwarfing of the plants. The trouble was experimentally proved to be due to incompatibility between the lilac scions and the privet [*Ligustrum vulgare*] stocks on which they are commonly grafted, and it is recommended that lilac should be propagated by the various 'own root' methods of layering, use of suckers, and by hard and green wood cuttings. Reports of the condition under discussion have also been received from Oregon, Ontario, and Germany.

WEISS (F.) & MCWHORTER (F. P.). **Pacific Coast survey for Rose mosaic.**—*Plant Disease Reporter*, xiv, 20, pp. 203–205, 1930. [Mimeographed.]

The writers' recent survey of the Pacific Coast for rose mosaic [which term they prefer to infectious chlorosis: *R.A.M.*, x, p. 11] revealed the occurrence of the disease on *Rosa odorata*, not hitherto reported to be infected. Plantings of this species were observed in which at least 5 per cent. of the bushes showed severe or even extreme symptoms. The susceptibility of *R. odorata* was independently demonstrated by a California grower who budded healthy roots with diseased Hybrid Tea buds. Other varieties found to be affected include several Hybrid Perpetuals and Climbing American Beauty. In none of the commercial plantings inspected was the disease sufficiently prevalent seriously to impair the general quality of saleable plants. In a few cases, chiefly among Manettis, there was evident multiplication of a relatively small amount of mosaic in mother blocks used as a source of cuttings.

WEISS (F.) & MCWHORTER (F. P.). **A Sclerotium disease of the White Calla.**—*Plant Disease Reporter*, xiv, 20, pp. 205–206, 1930. [Mimeographed.]

In July, 1930, a species of *Sclerotium* having sclerotia somewhat irregular in form, with surface roughenings, and intermediate in size between those of *S. rolfsii* and *S. delphinii* [*R.A.M.*, ix, p. 38] was found attacking White or Nile Calla lilies (*Zantedeschia aethiopica*) in a seven-acre field at Brookings, Oregon. This is apparently the first record of a *Sclerotium* on the host in question. Infected plants showed a soft decay of the lower two-thirds of the corm, while the thick feeding roots were also consumed, sometimes to a depth of 6 or 8 inches. Occasionally the base of the aerial structures was also invaded, and sclerotia were formed on them above ground. In other cases the exposed portions of the plants showed yellowing, flaccidity, and marginal necrosis of the leaves, much resembling the symptoms associated with the *Phytophthora* root rot of the Calla lily [ibid., ix, p. 787]. A second visit to the affected field, forty days after the first, showed a slight spread of infection, but the fungus was no longer active, having evidently been checked by the cool weather of late August and early September. The fungus is thought to have been introduced into the field on corms planted in 1929 from Watsonville, California, where a succeeding crop of tomatoes was also found to be attacked by a *Sclerotium*.

GRIFFITHS (D.). **Daffodils.**—*U.S. Dept. of Agric. Circ.* 122, 73 pp., 47 figs., 3 diags., 1930.

In the section of this paper dealing with daffodil diseases, mention is made (pp. 62–63) of a group of conditions known as 'broken' [cf. *R.A.M.*, viii, p. 788], mottling, mosaic, yellow stripe, grey disease, &c., some of which are believed to be due to a virus. Some varieties are particularly addicted to these troubles, e.g., Minister Talma. Conspicuus. Sir Watkin, Princeps, and Sir Joseph Berkeley, while Double Van Sion, Empress, and Victoria seldom contract them. The condition is slow in spreading and roguing may be successfully carried out when the plants are 6 to 8 inches high and before flowering.

BAUDYŠ (E.). **Sclerotium rhizodes na travách.** [*Sclerotium rhizodes* on grasses.]—*Mykologia*, Prague, vii, 4–5, pp. 50–55, 4 figs., 1930. [English summary.]

In giving a brief account of the ever-increasing damage done to meadow grasses by *Sclerotium rhizodes* in Czecho-Slovakia [*R.A.M.*, viii, p. 289], the author states that the fungus was never observed by him in a fruiting condition either in nature or in culture. The morphological characters of the sclerotia of *S. rhizodes* are so different from those of the *Typhula graminum* sclerotia that he does not believe the two fungi belong to the same species [cf. ibid., viii, p. 21]; in the former the sclerotia are subglobose, scarcely glabrous, rough, and blackish, and in the latter they are irregular in shape, somewhat flattened, and reddish-brown. The author is rather inclined to consider *S. rhizodes* as belonging to the genus *Sclerotinia*, although he was not able to obtain a definite proof of

this hypothesis. The fungus shows affinities with *S. menieri* Boud. and *Sclerotium irregulare* on rice, but is distinct from *S. oryzae-sativae* as described by Hemmi and Yokogi [ibid., vii, p. 266].

KOEHLER (B.). **Alfalfa diseases in Illinois.** [ex Growing Alfalfa in Illinois.]—*Illinois Agric. Exper. Stat. Bull.* 349, pp. 444–447, 3 figs., 1930.

The three most important diseases of lucerne in Illinois are stated to be leaf spot (*Pseudopeziza medicaginis*) [*R.A.M.*, ix, p. 187], yellows [ibid., viii, p. 42], and bacterial wilt [*Aplanobacter insidiosum*: ibid., x, p. 110], popular notes on all of which are given.

CHASSET (L.). **Résultats obtenus par deux traitements d'hiver et un de printemps sur la végétation des arbres et la qualité des fruits.** [Results given by two winter and one spring treatment in respect of the growth of the trees and the quality of the fruit.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 24, pp. 826–832, 1930.

Excellent control of the fungous and insect parasites of fruit trees with a marked improvement in the quality of the fruit has been given in the districts under the supervision of the Villefranche (Rhône) Viticultural and Pomicultural Station, by two winter treatments and one in the spring. The former consisted of commercial preparations with a foundation of soluble anthracene oil (7 to 8 kg. per 100 l. of water), formol codex 35 per cent. (2 kg. per 100 l.), and sulphurated, soluble schistose oil from the Orbagnoux mines (2 kg. per 100 l.) [cf. *R.A.M.*, x, p. 36], and the latter of copper sulphate (2 kg. per 100 l.), lime (0·5 kg.), and 80 gm. casein per hectol. [This paper also appears in *Prog. Agric. et Vitic.*, xcvi, 47, pp. 502–505, 1930.]

LLOYD (J. W.) & NEWELL (H. M.). **Some factors influencing the keeping quality of fruit in transit.**—*Illinois Agric. Exper. Stat. Bull.* 350, pp. 451–484, 6 figs., 3 diags., 1930.

The decay in transit of apples, peaches (by *Rhizopus* [*nigricans*] and brown rot [*Sclerotinia americana*]), and strawberries grown in Illinois has been found to be greatly increased by careless and unsuitable methods of handling the fresh fruit. Full directions, based on observations and experiments [which are described], are given for the rectification of these errors, and suggestions are made for improvements in the construction of packing crates and other precautionary measures calculated to reduce the injury.

MOORE (M. H.). **Apple scab at East Malling.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1929, to 31st December, 1929*, pp. 72–75, 1 pl., 1930.

In the spraying tests [details of which are given] conducted during three years at East Malling Research Station, Kent, against apple scab [*Venturia inaequalis*: *R.A.M.*, x, p. 37], mainly on Cox's Orange Pippins, very good control was given by a pre-blossom and two post-blossom applications of lime-sulphur with

lead arsenate paste, the first application being made at a concentration of 1 in 30, and the two subsequent ones at 1 in 100; no damage was caused to the fruit.

The critical period for scab development approximately coincided with blossoming; when the pre-blossom spray was omitted, and the weather at that time favoured infection, the disease progressed so rapidly as to render the post-blossom applications largely ineffectual.

That the seasonal factor affects the efficacy of control measures was indicated by the fact that in 1927, though the summer as a whole was very wet, there was very little scab on the sprayed plot, whereas in the two following years, which were dry and sunny, the controls were badly affected. This is explained by the fact that in 1927 the weather during late April and May was dry and sunny and scab development was checked; the pre-blossom application gave very little benefit, infection on the unsprayed trees being very slight. In 1928, when the corresponding period was wet, the disease became rife early, and a pre-blossom spray sufficed to give very good control. In 1929, an abnormal drought prevailed, but the severe infection of the unsprayed trees was possibly due to the heavy night dews in summer.

COOLEY (J. S.) & MILLER (P. W.). **Studies of perennial canker disease of the Apple.**—Abs. in *Phytopath.*, xx, 10, pp. 851–852, 1930.

Successful inoculation experiments were carried out with the causal organism of perennial canker of apples (*Gloeosporium perennans*) [see above, p. 163] throughout the rainy season (from September to June) of 1929–30, the highest percentage of positive infection being in the autumn. Wounds inflicted by driving a nail into the wood and by bruising with a pointed-headed mallet gave much higher infection percentages than those made by a sharp tool. Infection was accomplished experimentally in fresh wounds free from woolly aphis [*Eriosoma lanigerum*] infestation. Under natural conditions infection may occur on fresh wounds but is frequently found on healing calluses injured by cold. In the summer of 1929 the fungus was isolated from pruning wound calluses with one or more dead areas, 2 to 10 mm. or more in width, on the margin resembling winter injury followed by canker infection. In March, 1930, isolations were made from calluses free from canker in 1929 but showing dead margins apparently resulting from recent winter injury. Most of the first attempts at isolating the fungus gave negative results, but subsequent isolations showed an increasing number of positive infections by the canker fungus, denoting that canker infection readily occurs in the winter-injured margins of pruning wound calluses.

RUEHLE (G. D.). **Cladosporium species from Apple fruit and the perfect stage of Cladosporium herbarum Lk.**—Abs. in *Phytopath.*, xx, 10, p. 854, 1930.

Three species of *Cladosporium* have been found to be weak parasites of apples in cold storage. The first (considered to be a new species [but not described]) produces rapidly growing, fluffy

colonies and light brown, cylindrical conidia in long chains. The second produces dense, slow growing colonies and conidia typical of *C. herbarum*. After six months' growth on sterilized wheat leaves at 10° C., this form developed large numbers of black, fertile perithecia believed to be identical with *Mycosphaerella tulasnei* [*R.A.M.*, x, p. 10], reported as the ascigerous stage of the fungus in 1893. On germination, single ascospores produced colonies of the *C. herbarum* type. The third form was identified as *Hormodendrum cladosporioides* [ibid., ix, p. 77]. The damage caused by these fungi on stored apples is inconsiderable, consisting merely of small, shallow, dark rots round stem punctures and worm holes.

BARSS (H. P.). **European and American brown rot blossom blight in western Oregon.**—Abs. in *Phytopath.*, xx, 10, p. 855, 1930.

Serious blossom blight of cherries occurred in many orchards in the Willamette Valley in 1929 and a considerable amount was again observed in 1930. Isolations from material from widely scattered orchards showed that the European fungus, *Sclerotinia cinerea* f. *pruni* [*R.A.M.*, ix, p. 39], predominated by three to one over the common American form, *S. americana* [ibid., viii, p. 553], in 1929, and in 1930 also the former was greatly in excess of the latter. From early infections on cherries and prunes, only the American form was isolated in the same year. European brown rot was reported on sweet cherry foliage, flowering almond twigs, and cherry leaves previously invaded by witches' broom (*Exoascus*) [*Taphrina cerasi*].

MCCLINTOCK (J. A.). **The longevity of Phyllosticta solitaria E. & E. on Apple seedlings held in cold storage.**—*Phytopath.*, xx, 10, pp. 841–843, 3 figs., 1930.

Since 1923 blotch (*Phyllosticta solitaria*) cankers have been found on apple seedlings imported into Tennessee from mid-western nurseries [*R.A.M.*, ix, p. 436]. Cankers were found early in March, 1929, on apple seedlings grown in mid-western nurseries in 1927 and held in cold storage throughout the growing season of 1928. There was no evidence that the fungus made any growth during the storage period, but stored seedlings with numerous blotch cankers, set in large pots in the greenhouse, showed fresh activity of the cankers as the season advanced and the fungus had evidently remained alive. Leaves on these seedlings and on small seedlings grown directly from Yates seed planted in the pots developed typical leaf blotch spots, and later in the season petiole infections developed on the small Yates seedlings. Some of the less heavily infected of the stored seedlings, in field tests, showed renewed growth of the cankers in 1929, and a similar development took place on seedlings planted in a commercial nursery some 200 miles from the University farm. Observations on the location of inserted buds indicated that a high percentage of infection results from placing the buds in close contact with the cankers. The ability of *P. solitaria* to survive prolonged storage emphasizes the importance of inspection and removal of all blotch-infected

seedlings from stocks destined for holding in cold storage as well as from those intended for use the following year.

ESMARCH (F.). **Woher kommt die Rissigkeit der Birnen und Äpfel?** [What is the cause of the fissures in Pears and Apples?]—*Die Kranke Pflanze*, vii, 10, pp. 142–144, 1 pl., 1930.

A popular account is given of the symptoms, life-history, and control of apple and pear scab (*Venturia inaequalis* and *V. pirina*) under German conditions, with special reference to the fissures of varying depth on the fruit which were a marked feature of the 1930 harvest. Infection of the branches has been found to be much more prevalent on pears than on apples. Notes are given on varietal susceptibility to both fungi and on their control by cultural measures and spraying with 2 per cent. Bordeaux mixture or 1 in 10 lime-sulphur before the buds open, followed by three applications at stated intervals of 1 per cent. Bordeaux mixture for pears and 1 in 30 lime-sulphur for apples [*R.A.M.*, vi, p. 670; ix, p. 657, *et passim*].

RAWLINS (T. E.) & HORNE (W. T.). **A graft-infectious disease of the Cherry.**—Abs. in *Phytopath.*, xx, 10, p. 853, 1930.

A severe disease of sweet cherries, characterized by the development of conical fruits, which shrivel before ripening, occurs in several valleys of California. During early autumn the leaves of diseased trees show a reddish-purple coloration of the mid-rib extending outwards along the larger veins. The condition has been transmitted by grafting scions from diseased Napoleon to healthy individuals. Trees on Mahaleb rootstocks have shown considerable resistance to the disease, while those on the Mazzard are very susceptible.

BENNETT (C. W.). **Further observations and experiments on the curl disease of Raspberries.**—*Phytopath.*, xx, 10, pp. 787–802, 2 figs., 1930.

Full particulars are given of the writer's field investigations in Michigan, extending from 1926 to 1928, on leaf curl of raspberries [*R.A.M.*, viii, p. 731]. The symptoms of the disease are practically identical on the red and black varieties, leading to the tentative assumption in the past that the same virus was responsible for the disturbance on both. From these experiments, however, it appears that the curl virus from the red Cuthbert variety will not infect the susceptible black Cumberland. On the other hand, the curl virus occurring on Cumberland is transmissible to Cuthbert and can be transferred from this variety back to the black raspberry. Apparently, therefore, two viruses are involved which are termed alpha and beta respectively.

The purple variety Columbian shows marked symptoms of curl when attacked by the beta virus and mild ones when infected by alpha. Plants attacked by the alpha virus remain susceptible to infection by beta. Columbian raspberries infected by the alpha virus recover completely after a period ranging from a few months to two years, new growth being free from disease. Transmission

of the two viruses was obtained only by means of *Aphis rubiphila*, which was active in all stages including the winged form, this being apparently very important in long-distance dissemination. *Amphorophora rubicola*, *A. rubi*, and *A. sensoriata* proved useless for purposes of transmission.

Report on trials and experiments carried out on fruit, flowers and vegetables at the Tamar Valley Horticultural Experimental and Demonstration Station, Bere Alston, 1926–1930. — 47 pp., 1930.

This report contains, *inter alia*, some observations on the various lines of investigation which are being followed up in the Tamar Valley for the control of 'patch' disease of strawberries [*R.A.M.*, vii, p. 650], the etiology of which still remains obscure. A species of mite, which has been detected on all the diseased plants, is thought possibly to be the primary cause of the trouble.

HORNE (W. T) & PARKER (E. R.). **The Avocado disease called sun-blotch.**—Abs. in *Phytopath.*, xx, 10, p. 852, 1930.

Sun-blotch is the name given to a peculiar avocado disease characterized by obscure longitudinal, pale, yellowish, or reddish-purple streaks or blotches in the fruit, streaks in vigorous shoots, roughening and decumbency in older stems, and rough bark of the trunks, while an irregular foliar variegation observed by the writers is also believed to be connected with the disease. In its more intense phase the disease is very serious, though the symptoms may be inconspicuous. Sun-blotch scions produce diseased trees when grafted on healthy stocks, shoots from the latter being observed to be affected in three cases, while healthy scions on affected stocks probably also produce diseased trees. The disease appears, therefore, to be a form of infectious chlorosis.

COULSON (J. G.). **Some notes on seed treatments.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 17–27, 1929. [Received November, 1930.]

After briefly referring to the history of seed treatment methods devised to control seed-borne diseases of plants, and listing a number of the commoner of such diseases, the author reviews the present status of knowledge regarding seed disinfection from various standpoints. In particular the use of certain standard disinfectants is discussed and injury resulting from seed disinfection considered. Reference is also made to the estimation of the fungicidal value of seed disinfectants and the influence of seasonal factors. A bibliography of 45 titles is appended.

HOWATT (J. L.). **Some studies on the use and action of bichloride of mercury as a fungicide.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 40–42, 1929. [Received November, 1930.]

After briefly discussing the nature of the toxic action exercised by mercuric chloride, the author states that it seems reasonable to consider that the control effected by it in certain seed-borne diseases is due to the germination of the spores being sufficiently

retarded for them to be outgrown by the host and so removed from the meristematic tissue necessary for their further development, as may be instanced in certain smuts.

Concentration, temperature, time of action, association, age of spore and host plants, and type of seed are all considered to affect the toxicity, and stimulation of the seed after treatment is attributed not to direct fungicidal action but rather to the indirect partial sterilization effect on the soil.

PETCH (C. E.) & HOWATT (J. L.). **Effects of some sulphur sprays on fruit-bud development.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, p. 39, 1929. [Received November, 1930.]

In 1928, tests were made to compare the effects of koloform (prepared by fusing bentonite and sulphur, with calcium caseinate added to assist in mixing with water) with those of lime-sulphur on the development of apple trees, the former mixture being applied at the rate of 8 lb., and the latter at 1 gall., to 40 galls. water, respectively. The trees were sprayed six times under comparable conditions.

Burning and dwarfing of the foliage remained prevalent on the trees treated with lime-sulphur; later, the average length of the koloform-treated buds was 0·4903 in. as compared with 0·3979 in. for those sprayed with lime-sulphur. This increase in the length of the former, which amounts to 23·22 per cent., is attributed to the koloform-treated foliage having remained free from injury.

TAYLOR (C. F.). **Recent developments in the use of sulphur fungicidal sprays.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 28–32, 1929. [Received November, 1930.]

After briefly referring to the history of the use of sulphur against fungous diseases the author states that investigations made in Nova Scotia to devise a safe, reliable sulphur spray for orchard use led to the adoption of a lime-sulphur, aluminium sulphate, and calcium arsenate mixture [cf. *R.A.M.*, ix, pp. 460, 656]. In commercial practice the mixture is made up as follows: 1 gall. lime-sulphur at 33° Baumé, 3¾ lb. aluminium sulphate crystals, and 1 lb. calcium arsenate per 40 galls. water; the aluminium sulphate is added when commencing to fill the tank, and the lime-sulphur is added when the tank is nearly full, the calcium arsenate being added last. In 25 comparative tests made with this and lime-sulphur and Bordeaux spray against apple scab [*Venturia inaequalis*] the average percentages of scabbed fruits for the standard sprays, the aluminium sulphate mixture, and the unsprayed controls were, respectively, 22, 25·6, and 94. The apples from the plots treated with the aluminium sulphate mixture were of very good appearance; about equal in colour to those from the lime-sulphur plot and in several instances superior to those from the Bordeaux plots. The foliage of trees sprayed with the aluminium mixture was larger and greener than that on the plots sprayed with lime-sulphur and showed no injury except, very occasionally, some 'yellow leaf' following the final summer

application of the mixture to certain varieties. This symptom is associated with the use of arsenate of lime, which should be reduced, if possible, in this application to 0·5 lb. to 40 galls. spray.

Conclusive evidence was obtained that the inclusion of the calcium arsenate definitely added to the fungicidal value of the mixture; care must be taken not to inhale hydrogen sulphide fumes from the concentrated mixture and not to bring a naked flame near it.

Notes are also given on lime-sulphur iron sulphate mixture, self-boiled lime-sulphur, dry lime sulphur, dry-mix lime-sulphur, wettable sulphur, and soluble sulphur.

NEWTON (W.) & HASTINGS (R. J.). **A new sulphur-resin spray.**—*Scient. Agric.*, xi, 1, pp. 26–28, 1930.

Details are given of a new fungicidal spray devised by the authors, and composed of potassium hydroxide, flowers of sulphur, and pine resin [cf. *R A M.*, ix, p. 560]. The dry powdered form, in all respects the most satisfactory, is prepared by fusing 4 lb. sulphur, 4 lb. resin, 7 lb. potassium hydroxide, and 1 lb. water, sufficient heat being self-generated to fuse the mixture without any external heating. During the reaction stirring is necessary to prevent charring. A granular mass is obtained which dries to a granular powder if spread out into thin layers before the fuse cools. This powder readily dissolves in cold water; 16 lb. powder in 100 galls. water give a satisfactory spray strength.

Owing to its spreading and adhesive qualities, and to its inconspicuousness this spray is very suitable for ornamental plants. Both the potassium polysulphide and the potassium resin are strong fungicides, while the spray is also an effective contact insecticide.

EDGE (R.). **Determination of sulphur in insecticides and fungicides by carbon disulfide extraction.**—*Indus. & Engin. Chem., Analyt. Ed.*, ii, 4, pp. 371–373, 1930.

A method has been developed whereby the free sulphur occurring in various insecticidal and fungicidal dusts as flowers of sulphur may be converted, with practically no loss, into the carbon disulphide-soluble form through the agency of controlled heating, in which form it may readily be determined by carbon disulphide extraction. The procedure is as follows. A quantity of a given sample containing 1 to 3 gm. sulphur is weighed into a small beaker of about 150 c.c. capacity and moistened with 10 to 15 c.c., alcohol (1 : 3); 15 c.c. of nitric acid (1 : 4) is then added and the whole stirred. A further 40 c.c. of nitric acid (1 : 2) is then added and again stirred; after the mixture has stood for five minutes the liquid is decanted through filter paper in short-stem funnels. Another 10 to 20 c.c. of the nitric acid (1 : 2) is added in order to dissolve any acid-soluble material remaining from the previous acid treatment. After filtering and washing, the residues are allowed to drain for 20 to 30 minutes, or overnight, and are then heated, in the former case for 4½ hours, and in the latter for 4 hours, in an oven regulated at 105° to 110° C. At the end of this time the funnels holding the filters are removed and the sulphur

extracted with successive small quantities of carbon disulphide (up to 50 c.c. or more), which should be received in tared beakers. These are placed on a steam bath and left for about an hour after the evaporation of the carbon disulphide, wiped free of moisture, kept in a desiccator for several hours, and weighed.

The results obtained by this method are stated to compare very favourably with those given by the tedious oxidation process.

GRAINGER (J.) & COCKERHAM (G.). **Some properties of the virus extract of Dock mosaic.**—*Proc. Leeds Phil. Soc. (Scient. Sect.)*, ii, 3, pp. 120–124, 1930.

During the summer of 1929 the writers conducted a series of experiments to determine the nature of the infectious chlorosis of docks (*Rumex obtusifolius* and *R. lanceolatus*) previously reported as occurring in the Leeds district [*R.A M.*, viii, p. 449].

The inoculation (by leaf tissue mutilation) of healthy dock seedlings, obtained from a locality near Huddersfield where the disease was not prevalent, with the virus extract of mosaic plants gave positive results at a dilution of 1 in 100, but not at 1 in 1,000. The only pathological symptom manifested by the inoculated plants was a mottling of pale green spots, usually between the anastomosing veinlets of the leaf. The virus extract was not inactivated after standing in a corked bottle for 14 days, and dried diseased leaves were still infectious after 21. Ten minutes' exposure to a temperature of 80° C. destroyed the infectivity of the extract, which was also rendered inert by 2 per cent. formalin in 30 minutes, but not by 95 per cent. alcohol in the same time. The virus was not infectious after passage through a Jenkins filter or an English Berkefeld candle. At a temperature of 75° F. the characteristic mottling of infected plants was found to be almost entirely absent. Of the 127 seedlings derived from the seed of a mosaic plant, none showed any symptoms of the disease, from which it would appear that the condition is not seed-borne. The hydrogen-ion concentration of infected docks was found to be P_H 5·2, compared with 4·8 for healthy ones.

These results, while not affording conclusive proof that the cause of chlorosis in docks is a virus, are considered to justify the provisional classification of the disturbance among this group of diseases.

CURZI (M.). **Ricerche morfologiche e sperimentali su un micromicete termofilo (Acremoniella thermophila Curzi).** [Morphological and experimental researches on a thermophilic micromycete (*Acremoniella thermophila* Curzi).]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 222–280, 4 pl., 13 figs., 1 graph, 1930.

In this detailed account of his investigations into the morphology and physiology of *Acremoniella thermophila* [*R.A.M.*, ix, p. 101] the author describes in detail a new type of variation by saltation, in which two colonies having opposite characters appeared in alternate generations [cf. ibid., ix, p. 612]. Three different cases were distinguishable: (1) the variation was regular and complete, (2) or it was disturbed by the appearance of sectors representing

new series of reversible variations, (3) or non-reverting sectors appeared.

From a colony derived from successive transfers five strains were separated, corresponding to five different sectors. The intermediate strains showed a sparser aerial mycelium and were more stable than the others, while the two extreme ones had a more copious aerial mycelium and were less stable than the rest.

Except in a few doubtful cases the reversions were never more than approximately complete.

PETRI (L.). **La nutrizione minerale delle piante in rapporto alla predisposizione o alla resistenza di queste a cause patogene.** [The mineral nutrition of plants in relation to their predisposition or resistance to attack by pathogenic agents.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 121–152, 1930.

After pointing out how the susceptibility and resistance of plants to pathogenic agents are affected by their nutrition, the author describes and discusses in detail the action exerted by different fertilizers (including nitrogenous, phosphatic, and potassic dressings, lime, gypsum, sulphur, iron and aluminium sulphates and manganese salts) on the anatomical and physiological properties of plants with reference to their resistance to injurious inorganic agencies as well as to various [named] fungous and animal parasites. The conclusions reached may be very briefly summarized as follows.

In general, nitrogenous dressings aggravate susceptibility, whereas phosphatic and potassic dressings reduce it. Fertilizers always act indirectly upon the mechanism of host resistance, and are influenced by local factors. Tests of their protective action should always be carried out on strictly comparative lines, laboratory experiments being made with cultures in liquids or on sand to ascertain the quantitative relation between various fertilizers and nutrients which corresponds to maximum resistance to a given pathogen, the same tests being repeated in the field to determine the influence of the environment (such as climatic factors). A comprehensive bibliography is appended.

KOSTOFF (D.). **Protoplasmic viscosity in plants. IV. Cytoplasmic viscosity in tumors of Nicotiana hybrids.**—*Protoplasma*, xi, 2, pp. 193–195, 1 fig., 1930.

In order to determine the relation of cytoplasmic viscosity to the cytological condition of the rapidly proliferating tumours observed in many species hybrids of *Nicotiana* [*R.A.M.*, ix, p. 797], the author centrifuged tumours and normal stems from plants of the cross *N. glauca* × *N. langsdorffii* at 18° to 18·5° C., inverted the tubes containing the material, and fixed it for 10 to 15 minutes. The starch in the tumour cells was still a compact mass at the centrifugal side 15 minutes after centrifuging, while the starch grains in the sheath cells at the same time had almost returned to the normal general distribution throughout the cells. The cells of the tumour parenchyma, therefore, have a higher cytoplasmic viscosity than those of the starch sheath.

The rapid proliferation of the tumours appears to be due to the

favourable conditions for cell division created by the increased cytoplasmic viscosity, in addition to the accumulated proteins and carbohydrates abundant in the regions of proliferation. Hence it might be expected that proliferation could be artificially induced by agents increasing the cytoplasmic viscosity in hybrids where tumorous proliferation proceeded relatively slowly in consequence of insufficient mutual reaction, and this phenomenon was actually often observed. Wounding is known to increase the cytoplasmic viscosity in the surrounding regions, and in the case of *N. glauca* × *N. langsdorffii*, hybrids normally forming only small tumours were stimulated by wounding to produce walnut-sized growths.

MORRIS (H. E.) & YOUNG (P. A.). **Potato diseases in Montana.**—*Montana Agric. Exper. Stat. Bull.* 227, 51 pp., 23 figs., 1930.

In this bulletin, the object of which is to facilitate the identification and control of the chief potato diseases present in Montana, where the annual loss so caused amounts to some 16 per cent. of the crop, a key is given, in which the symptoms of each disease are summarized and tabulated. In the text itself, notes on seed selection and disinfection, crop rotation, spraying, and storage are followed by brief descriptions of the causes, symptoms, and control of the diseases. These comprise *Rhizoctonia* (*Corticium solani*), scab (*Actinomyces scabies*), blackleg (*Bacillus atrosepticus*) [*B. phytophthorus*], early blight (*Alternaria solani*), field wilt (*Fusarium oxysporum*), storage dry rot (*F.* spp.), numerous physiological conditions and other injuries, and the virus group, including rugose, crinkle, super-mild and mild mosaics, mottled and unmottled curly dwarf, spindle tuber, giant hill, leaf roll, witches' broom, calico, spindling sprout, psyllid yellows, and yellow dwarf.

SCHLUMBERGER [O.]. **Beobachtungen und Erfahrungen über den Gesundheitszustand der Kartoffeln im Jahre 1930.** [Observations and experiences in connexion with the state of health of Potatoes in the year 1930.]—*Pflanzenbau*, vii, 4, pp. 118–119, 1930.

Common scab [*Actinomyces scabies*] was extremely prevalent on early potatoes in Germany during June and the beginning of July, 1930, in consequence of the dry weather. Some brief observations are made on varietal resistance to this disease [*R.A.M.*, ix, p. 553]. Neither blight (*Phytophthora infestans*) nor blackleg (*Bacillus phytophthorus*) occurred in epidemic form, but early potatoes suffered from the tuber rot caused by the former, while secondary infection of the tubers by passage of the blackleg bacteria down the stolons was common. Sprain [ibid., ix, p. 199] was again fairly prevalent on various red-skinned white-fleshed varieties. Sickingen and Industrie are very liable to this disease. *Rhizoctonia* [*Corticium solani*] was widespread, but caused little reduction of yield, and the writer considers that exaggerated importance is attached to the pitting caused by this fungus. Numerous cases were observed of spread of mosaic and other virus diseases from plant to plant in the field, indicating the importance of timely roguing.

COULSON (J. G.). **The effect of gypsum upon the growth and common scab of the Potato.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 64–80, 1929. [Received November, 1930.]

An account is given of tests conducted in Canada to ascertain the effects of gypsum applications upon the growth of potatoes, the development of scab (*Actinomyces scabies*), and the growth of the fungus.

Pots were filled with a weighed amount of fine clay loam treated with gypsum and a 4–8–6 fertilizer at various rates, and planted with uniform Green Mountain tubers, the pots being moved into the open after a requisite time in the greenhouse. The tabulated results show that an application of gypsum alone equivalent to 250 lb. per acre gave 50 per cent. of infected potatoes, one of 1,000 lb. per acre gave 53·5 per cent., whereas an application of fertilizer alone gave only 20 per cent., and one of gypsum and fertilizer mixed at the rates of 3,000 and 2,000 lb. per acre, respectively, gave 24 per cent. scabbed, as compared with 24·3 per cent. in the untreated controls.

A field test in 1927 in which gypsum was applied at rates of 250, 500, 1,000, 2,000, and 3,000 lb. per acre, respectively, gave average yields of diseased tubers of 9·94, 13, 13·06, 15·44, and 20 lb., respectively, out of total yields of 46·94, 41·5, 38·69, 38·81, and 39·19 lb., respectively, while the control gave 10·27 lb. out of 40·40 lb. Increasing applications of gypsum progressively reduced the number of tubers formed, whilst there was an increased amount of scab infection, though with the 250 and 500 lb. treatments the differences were not significant. A second field test in 1928 gave indecisive results.

A laboratory test showed that the addition of gypsum did not affect the P_H value of the soil, and when gypsum was added to potato dextrose agar in amounts ranging from 0·5 to 50 per cent. no difference in the rate of growth of *A. scabies* on the medium was observed.

[A condensed version of this paper appears in *Proc. Canadian Phytopath. Soc., 1929*, pp. 55–57, 1930.]

REILING (H.). **Eine züchterische Studie zur Dürrfleckenkrankheit der Kartoffel.** [A study of the dry spot disease of the Potato from the standpoint of selection.]—*Der Züchter*, ii, 11, pp. 317–323, 4 figs., 1930.

Further investigations [the results of which are tabulated and discussed] on the reaction of potato hybrids raised from seed at Soltau (Hanover) to early blight (*Alternaria solani varians*) [*R.A.M.*, viii, p. 262; x, p. 77] again demonstrated the importance of heredity in the development of the disease. The common view that the early varieties are uniformly susceptible and the late ones uniformly resistant was not altogether supported by these experiments, in which a number of the early hybrids proved very resistant while some of the late ones were highly susceptible. Certain susceptible parents, however, e.g., Odenwälder Blaue, are almost sure to transmit to their progeny a predisposition to infection by *A. solani*. As in former tests, the Magdeburger Blaue, Ally, and

Arnika varieties were heavily damaged by *A. solani*, while Bella Donna, Geheimrat Walter, Allerfrüheste Gelbe, and Present, formerly susceptible, showed little infection in these trials. At the time of the observations (7th August), there was also little or no infection on Duke of York, Juli, Allerfrüheste Hörnchen (Müllers), Rote Rosen, Ostara, and Victor (Clausen), all early varieties; on the other hand, Goldniere (usually regarded as a synonym of Duke of York), Atalanta, Odenwälder Blaue, Goldball, Arran Comrade, Primel, Franzesa Negra, and Alpha were severely damaged.

In the case of asexually propagated plants, the critical period for infection by early blight coincides with the climax of development, the symptoms appearing just after flowering. With seedlings, however, the fungus is most virulent during the first two to three months of life.

In the writer's opinion it is unnecessary to extirpate entire families of seedlings on account of infection by early blight as it is impossible to judge of their behaviour from one year's growth only; the roguing out of severely diseased individuals at the time of planting out in the field (early to mid-June) is considered quite sufficient.

BARIBEAU (B.). **Experiments on the value of dipdust as a disinfectant for seed Potatoes.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants., 1928–1929,* pp. 55–58, 1929. [Received November, 1930.]

In a test conducted in Quebec to compare the effectiveness of [Bayer] dip dust [cf. *R.A.M.*, viii, p. 594; ix, p. 336] with that of mercuric chloride as disinfectants of seed potatoes against *Rhizoctonia* [*Corticium solani*], two lots each of healthy and diseased seed pieces of Irish Cobbler potatoes were treated before cutting and a day before planting with mercuric chloride 1 in 1,000 for two hours, four other lots (two each of healthy and diseased pieces) being steeped for one minute in dip dust, 1 lb. per 2·5 galls. water; two lots each of healthy and diseased seed remained untreated as controls.

The [tabulated] results show that the healthy and diseased seed treated with dip dust yielded, respectively, 16·5 and 14 per cent. clean tubers, as compared with 10 and 12·5 per cent. for the corresponding lots treated with mercuric chloride, while the total yields per 200 hills were 273 lb. and 258 lb., and 291 lb. and 213 lb., respectively. Untreated healthy and infected seed yielded, respectively, 8·5 and 8 per cent. clean tubers, and 269 and 211 lb. per 200 hills.

MILLARD (W. A.). **The fungoid diseases associated with the eelworm attack on Potatoes.**—*Agric. Progress (Journ. Agric. Educ. Assoc.),* vii, pp. 58–60, 1930.

Popular notes are given on the occurrence on potatoes, in two northern districts of England, of stem canker or collar rot (*Corticium solani*) and black dot (*Colletotrichum atramentarium*) in association with eelworms [*Heterodera schachtii*: *R.A.M.*, viii, p. 262; ix, p. 335]. In the writer's opinion, the fungi, alone or in combination, are responsible for the bulk of the damage to the

affected plants, the pathogenicity of the eelworms being slight or negligible.

JØRSTAD (I.). **Om Potetkreften og dens bekjempelse.** [On Potato wart and its control.]—*Naturen*, liv, 7–8, pp. 246–259; 9, pp. 282–296; 10, pp. 310-321, 4 figs. 1 map, 1930.

This is a general survey of the present status of the potato wart (*Synchytrium endobioticum*) problem. The aspects under discussion include the systematic position and life-history of the fungus; the hosts of the latter and the effects produced on them; germination and infection conditions; mode of dissemination; possibilities of soil disinfection; immune varieties; and legislation. A map is given showing the distribution of the disease in Norway [*R.A.M.*, ix, p. 670].

HAKEN (T.). **Ein wesentlicher Fortschritt in der Anerkennung krebsfester Pflanzkartoffeln.** [An important advance in the certification of wart-immune seed Potatoes.]—*Deutsche Landw. Presse*, lvii, 41, pp. 561–562, 1930.

The current methods of organization of testing seed potatoes for immunity from wart disease [*Synchytrium endobioticum*] in Germany are discussed, with special reference to the work of the Westphalian Plant Protection Service. In this heavily infested region the annual field inspections are supplemented by laboratory tests on the lines of Spieckermann's method [*R.A.M.*, iii, p. 600], and it is suggested that a wider application of this procedure would be of far-reaching importance. A step in the direction of extending the tests has been taken by the Co-operative Seed Certification Organization, which proposes to check the varietal purity of the standard immune varieties, Parnassia and Preussen, by germinating 100 representative tubers of each, every spring.

SCHAEFER (E.). **Schwebende Fragen der Kartoffelanerkennung.** [Questions awaiting settlement in regard to Potato certification.]—*Pflanzenbau*, vii, 4, pp. 115–118, 1930.

Some important problems arising out of the certification of seed potatoes in Germany are still awaiting solution [see preceding abstract]. In this paper the writer discusses the possibilities (*a*) of forming an accurate judgement regarding the relative value of the various sources of seed supply; (*b*) the application of critical standards of valuation to the qualities of the potatoes in bulk, necessitating a second or final inspection of the stock after it has been placed in the wagons, &c., in which the consignments are transported; and (*c*) the division of the certified seed into definite categories of quality according to the Dutch system [cf. *R.A.M.*, x, p. 48].

SNELL [K.]. **Die Entwicklung der Kartoffel-Anerkennung.** [The development of Potato certification.]—*Pflanzenbau*, vii, 4, pp. 119–120, 1930.

Attention is drawn to various recent amendments calculated to increase the efficiency of the seed potato certification system in Germany [see preceding abstracts]. From 1931 new selections

must not only satisfy the requirements of the Potato Variety Register Commission in respect of varietal purity, but must also be immune from wart disease [*Synchytrium endobioticum*].

DE VOS (W. A.). **De bestrijding van meeldauw.** [The control of mildew.]—*De Bergcultures*, iv, 47, pp. 1258–1259, 1930.

During 1930 great progress was made in the control of rubber mildew [*Oidium heveae*] in Java by dusting with sulphur [*R.A.M.*, x, p. 56], but the economics of the method require further investigation. The quantities of sulphur applied over a given area by the machines used have been found in some cases to be up to $2\frac{1}{2}$ times the minimum amount required, while the area covered per day ranges from 40 to 120 bouw [39 bouw = 70 acres]. Such variations cannot be explained solely on the basis of varying local conditions, and an attempt should be made to apply the sulphur treatment by more rational methods.

ARTZ (C.). **Friend bestuivingsmachine.** [The Friend dusting apparatus.]—*De Bergcultures*, iv, 41, pp. 1090–1091, 3 figs., 1930.

Details are given of the construction and application of the 'Friend' apparatus for dusting with sulphur against rubber mildew [*Oidium heveae*: see preceding and next abstracts]. The machine is a water-cooled, one-cylinder, 5 h.p. motor with automatic gas regulation, the sulphur being supplied by means of a slide fitted with a handle. The apparatus is mounted on an iron frame with two fixed axles and four wheels, and measures 1·50 m. in length, 1·20 m. in breadth, and 1·25 m. in height (exclusive of the flexible blow-pipe); the weight is 275 kg. The benzine consumption is 1·5 l. per dusting hour, and the oil $\frac{3}{4}$ l. in four hours. The apparatus is stated to have given excellent results at Pondok Gedeh, the cost of the treatment (at the rate of 5 kg. sulphur per bouw) being Fl. 1·10 per bouw on rising ground, Fl. 0·80 on a moderate slope, and Fl. 0·60 on the level.

DOPHEIDE (A. B. A.). **Zwavel-verstuifapparaten in de praktijk.** [Sulphur dusting apparatus in practice.]—*De Bergcultures*, iv, 47, pp. 1259–1960, 1930.

The Björklund apparatus for dusting with sulphur against rubber mildew [*Oidium heveae*: *R.A.M.*, ix, pp. 128, 556] compares very favourably, judging by the writer's experience on the Proempang estate, Java, with the Friend [see preceding abstract]. The cost of the treatment on heavy to very steep ground was Fl. 0·79 per bouw (using 5 kg. sulphur), apportioned as follows: sulphur Fl. 0·65, benzine and oil Fl. 0·04, wages Fl. 0·09, and miscellaneous items Fl. 0·01. This works out at 31 cents per bouw cheaper than the Friend. The apparatus is constructed to treat about 15·5 bouw per hour. The total cost of four to seven applications of sulphur over the entire area of 600 bouw was approximately Fl. 3·90 per bouw (sulphur Fl. 3·16 or 81 per cent., benzine Fl. 0·16 or 4 per cent., lubricating oil Fl. 0·05 or 1 per cent., wages Fl. 0·46 or 12 per cent., and miscellaneous items Fl. 0·09 or 2 per cent.). The total quantity of sulphur used per bouw was 24·33 kg.

CHRISTOFF (A.). Плеоспората по културния Макъ. [The *Pleospora* disease of cultivated Poppy.]—iii + 99 pp., 11 pl., 1 diag., Sofia, Държавна Печатница. [Government Printing Office], 1930. [English summary.]

This is a detailed account of what is stated to be the most destructive disease of the opium poppy (*Papaver somniferum*) in Bulgaria, where the plant is extensively cultivated not so much for the sake of the drug as for that of the oil obtained from the poppy seed. A careful morphological and cultural study [full details of which are given] showed that the causal organism, which was erroneously identified by previous workers as *Dendryphium penicillatum* [*R.A.M*, ix, p. 488], is in reality a species of *Helminthosporium* and is identical with the fungus described by Sawada in 1918 under the name *H. papaveri*; this name is accepted for the Bulgarian fungus, since the binominal *H. papaveris* suggested by Hennings in 1907 is a *nomen nudum*. The perfect stage of the organism (which occurs both in nature and in pure culture) is a species of *Pleospora* for which the author adopts the name *P. calvescens* (Fr.) Tul. in preference to the later described *P. papaveracea* [loc. cit.]. The fungus is stated to be widely distributed in the Old World, wherever the opium poppy is grown as a field crop; in Bulgaria it is not known to attack any other host under natural conditions.

Field observations and artificial infection experiments showed that *H. papaveri* may attack all the aerial and underground organs of the host at all stages of development. Under favourable environmental conditions (e.g., warm, moist weather) the disease develops very rapidly and frequently destroys entire fields. Initial infection in the spring usually originates from ascospores from perithecia which form in abundance on dead stems and stubble in the field. Secondary infections are secured by conidia which develop so abundantly as practically to cover all the infected parts of the plants. A peculiar feature of the fungus, distinguishing it from other known species of *Helminthosporium*, is that it also forms chlamydospores; these are round or slightly ellipsoidal, smooth-walled bodies, hyaline to yellowish when young and brown to black when old, measuring 7 to 16 by 7·5 to 14·5 μ. The mycelium of the fungus can attack all tissues of the plant, and most of the seed contained in infected capsules is infected; such seed either has a very low viability or does not germinate at all. The optimum temperature for growth of the fungus in pure culture is 24° to 26° C., and the incubation period of the disease is from 2 to 8 days, according to the environmental conditions.

The control measures recommended are strict sanitation of seedbeds and fields, including the removal and destruction by fire of all plant débris and stubble, appropriate crop rotation, and the use of disease-free seed. Some measure of control was also obtained by steeping seed from diseased plants for one hour in 0·25 to 1 per cent. uspulun-universal, 0·25 to 0·5 per cent. germisan, 0·05 per cent. mercuric chloride, or 0·5 per cent. chigosan. Diseased plants in the field should be sprayed with 3 to 5 per cent. Bordeaux mixture or with 2 per cent. tutokilla, or else dusted with nosperit, all of which

gave satisfactory results in control experiments. The time of application and frequency of these treatments is entirely dependent on the seasonal conditions and severity of the disease.

BLATTNÝ (C.). **Studie o kadeřavosti Chmele.** [Studies on the 'kadeřavost' disease of the Hop.]—*Recueil de trav. des Inst. des Recherches Agron. de la République Tchécoslovaque*, Prague, lvi, 44 pp., 10 pl., 3 figs., 1930. [German and French summaries.]

This is a detailed account of the author's investigation, started in 1925, of the 'kadeřavost' [Kräuselkrankheit or curl] disease of the hop [*R.A.M.*, v, p. 127; x, p. 76] in Czecho-Slovakia, where it is stated to be of over 45 years' standing. The same disease also occurs in Poland and in Germany [ibid., viii, p. 603], and the nettlehead disease in England [ibid., viii, p. 627] may also be a form of it, although this last point wants confirmation. Very probably, however, the disease is much more widely distributed since, when mild, the symptoms are very difficult to recognize, and there is the further possibility that some characters which are now believed to be specific to certain varieties of hops are nothing else than symptoms of a chronic form of the trouble.

The constant symptoms include a protrusion of the veins, especially of their anastomoses, on the under side of the leaves; a sharper dentation and a more or less pronounced curling and waving of the leaf margins; and the concavity of the upper side of the leaf. Among the variable symptoms are included a whitening of the veins on the under side, the discoloration and brittleness of the leaf blade, the pathological exuberance of young growth, a stunting of side shoots in advanced stages of the disease, and a considerable reduction in the yield or complete sterility of the diseased plants. Histological examination showed that the disease is chiefly a hypoplasy of the leaf parenchyma, which leads to the degeneration of the chloroplasts, and later to lesions in the vascular system. A typical feature of the disease is the presence in the cells of various tissues of very small bodies (0·2 to 0·3 μ in diameter) which stain deeply with the Giemsa stain, and the significance of which is not yet clear.

Field observations and glasshouse experiments indicated that the disease is transmissible by cuttings, grafts, sap, insect agency, pruning implements, and also through the soil. Among the insects tested, the aphid *Phorodon humuli* gave so far negative results, but the disease was transmitted to two young plants out of ten by *Chlorita flavescens*; field evidence indicates that flea-beetles are also distributors of the disease.

The severity of the symptoms appears to be influenced by soil and environmental conditions, among which high humidity of the atmosphere has a moderating effect, while exposure to direct sunlight intensifies the symptoms. In manurial experiments there was evidence that the yield of diseased hops, in milder cases, may be considerably increased by higher applications of fertilizers. It is also pointed out that the symptoms show great variations in different varieties of hops (nine of which were studied), and it is not yet clear whether the nature of the virus was the same in all

the varieties investigated. Although, as a general rule, the severity of the symptoms increases with the age of the infected plants and with the age of infection, it varies considerably from year to year, according to the seasonal conditions. Once infected, a hop plant never recovers, even though it may remain one or two years without showing any symptoms.

The means of control recommended are the destruction of all badly infected plantations, and the removal and burning of infected plants in fields where the disease is sporadic. Infected plantations should not be replanted with hops before six, or preferably, ten years. Care should also be taken to use only healthy cuttings, and to keep down insect pests.

The Plant Pest and Disease Ordinance. Plant Pest and Disease (Import) Regulations, 1930.—Tanganyika Territory, Govt. Notice 177, 3 pp., 1930.

The following are the chief points in the Tanganyika Plant Pest and Disease (Import) Regulations, 1930 (dated 31st October), which supersede those of 1923 [*R.A.M.*, iii, p. 240]. The importation of living plants is prohibited except under permit from the Director of Agriculture. This restriction does not apply to seeds, except those of coffee (not including roasted coffee beans), cotton, tobacco, tea, cacao, coco-nut, groundnut, lucerne and clover, rubber, and maize for seed purposes, all of which, as well as any living plants imported into the Territory, must be inspected immediately on arrival by an officer of the Agricultural Department, who may, at his discretion, order their destruction, disinfection, or other treatment without compensation. All plants and the seeds specified above may only be imported by parcel post unless special permission is obtained. Directions are given for the packing of the plants and seeds and the fees chargeable for inspection, disinfection, and the like are listed. Provision is made for powers of search, seizure, and detention, and other relevant matters.

Colony and Protectorate of Kenya. The Diseases of Plants Prevention Rules, 1930, and The Diseases of Plants Prevention (Coffee) Rules, 1930.—12 pp., 1930.

The Kenya Diseases of Plants Prevention Rules, 1930, issued under the Diseases of Plants Prevention Ordinance, 1910, do not differ substantially from the regulations of 1924 [*R.A.M.*, iv, 63]. Onion and leek seeds are now omitted from the list of plant material the importation of which is prohibited except under official permit. Within certain areas, to be specified from time to time in the Gazette, the planting of maize on any farm must be preceded by the destruction of all maize roots, stalks, or shelled cores which may have been on the aforesaid farm immediately prior to the planting. 'Volunteer' maize must not be permitted to grow on any such farm. Full explanations are given of the Coffee Rules (movement and importation of plant material, inspection of land, and the like), which are directed mainly against insect pests.

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STEINMANN (A.). **Over een schimmel-ziekte der vruchten van der Notemuskaat op Java en de maatregelen voor hare eventuelle bestrijding.** [On a fungous disease of Nutmeg fruits in Java and the measures for its eventual control.]—*Arch. voor Koffiecult. Nederl.-Indië*, iv, 2, pp. 57–92, 5 pl., 2 graphs, 1930. [English summary.]

Nutmeg (*Myristica fragrans*) trees in the Dutch East Indies and other tropical countries are subject to a diseased condition manifested by the premature bursting and dropping of a proportion of the fruits, while the remainder are shrivelled, of inferior quality, and worthless for commercial purposes. The disease is of long standing, being the same as that formerly described in the Dutch East Indies by Janse (*Med. uit's Lands Plantentuin*, xxviii, 1898) and probably also as that described by Ridley from the Straits Settlements (*Agric. Bull. Malay Peninsula*, 6, p. 102, 1897). It is estimated that 61 to 64 per cent. of the crop has been lost through this cause on certain estates. Greenish-black, sunken spots, 0·5 to 2 cm. in diameter, are sometimes present on the husks of diseased fruits, while the underlying tissues show a brown discoloration. The maximum spread of infection occurs in Java during September and October.

The causal organism of the nutmeg disease is a fungus which the author names *Coryneum myristicae* n. sp. [with a Latin diagnosis]. The pulvinate acervuli are at first immersed in the epidermis, later erumpent; the pale olive, oblong to claviform or cylindrical, straight or slightly curved, 4- to 8-septate conidia, measuring 30 to 80 by 3·5 to 5 μ, with a somewhat acuminate base and obtuse or rounded apex, and not constricted at the septa, are borne on rod-shaped, simple or less often branched, subhyaline to pale olive, fasciculate conidiophores. The tissues under the spots are permeated by an intercellular mycelium of hyaline hyphae 2 to 3·5 μ in diameter.

Encouraging results in the control of the disease have been given by preliminary spraying experiments with Bordeaux mixture, combined with the removal of all the nuts from the trees. In laboratory tests the germination of the conidia was inhibited by xylol soap emulsion (1 per cent.), but the cost of this preparation is too high for use on a large scale.

Numerous tables are given showing the effect of the disease on nutmeg production in Java, and a bibliography of 27 titles is appended.

UNAMUNO (L. M.). **Hongos microscópicos de los alrededores de Caudete (Albacete).** [Microscopic fungi of the environs of Caudete (Albacete).]—*Bol. R. Soc. Española Hist. Nat.*, xxx, 7, pp. 379–390, 1930.

In this list of 65 species of fungi collected during April, 1928, in the environs of Caudete (south-eastern Spain) [cf. *R.A.M.*, ix, p. 611], of which eight are new to science, the following amongst others are of interest. *Septoria triticina* n. sp. forms elongated to ellipsoid, brown spots, 10 to 12 by 5 to 6 mm., on both surfaces of living wheat leaves. The amphigenous, black, punctiform, globose to ellipsoid-depressed pycnidia measure 160 to 274 by 157 to 230 μ, and the hyaline, filiform, straight or curved, uni- to tri-septate (generally tri-septate) spores, 39·5 to 83·5 by 1·5 to 2 μ. The new species is allied to *S. tritici* [ibid., x, p. 84], from which it differs, however, in its longer and narrower spores with fewer septa. Latin diagnoses are given of this and the other new species.

Strumella dryophila was found on the leaves of *Quercus coccifera* [cf. ibid., v, p. 81], this being the first record of the genus in Spain.

Cladosporium nerii was observed on the leaves of *Nerium oleander* for the first time in the Iberian Peninsula.

ATANASOFF (D.) & PETROFF (D.). **Списъкъ на констатиранитѣ въ България причинители на болести по растенията.** [List of plant diseases recorded in Bulgaria.]—102 pp., Sofia, Държавна Печатница [Government Printing Office], 1930.

In a brief preface the authors state that this list includes all plant diseases, whether due to bacteria, fungi, phanerogamic parasites, or undetermined causes, which, as far as they are aware, have been recorded in Bulgaria up to the end of 1928. The pathogens are arranged in the alphabetical order of their botanical names, with the names of their hosts, the localities where they were found, and references to the papers in which they were recorded. They are also listed under the botanical names of the hosts, the Bulgarian popular equivalents of which are given. This valuable compilation terminates with a bibliography of 414 titles.

MITTER (J. H.) & TANDON (R. N.). **The fungus flora of Allahabad. Part II.**—*Journ. Indian Bot. Soc.*, ix, 4, pp. 190–198, 1930.

A list (supplementing that published by K. L. Saksena in 1927) is given of 84 fungi collected in the town of Allahabad, the host, locality, and date of collection being indicated in each case.

DRECHSLER (C.). **Some new species of Pythium.**—*Journ. Washington Acad. of Sciences*, xx, 16, pp. 398–418, 1930.

Descriptions are given of 15 new species of *Pythium* from the eastern and south-eastern regions of the United States, viz., *P.*

dissotocum and *P. periilum* from sugar-cane rootlets, *P. myriotylum* from cucumber, watermelon, and eggplant fruits [*R.A.M.*, vii, p. 2] and tomato roots, *P. periplocum* and *P. acanthicum* from watermelon fruits, *P. paroecandrum* from a root of wild garlic (*Allium vineale*), *P. salpingophorum* and *P. oligandrum* from the roots of peas, *P. anandrum* from an underground bud of rhubarb, *P. mastophorum* from a root of *Bellis perennis*, *P. polymastum* from lettuce, *P. helicoides* from *Phaseolus vulgaris*, *P. oedochilum* from dahlia roots, *P. polytylum* from the root of *Prunella vulgaris*, and *P. palingenes* from the roots of *Ambrosia trifida*.

Three of these species are of economic importance. *P. periplocum* causes slight losses from the destruction of watermelon fruits, *P. acanthicum* is often actively destructive of the same host, to which it causes as much damage as all other species of *Pythium* combined, while *P. myriotylum* is also highly virulent. The last-named, like *P. butleri*, during periods of high humidity, puts forth a profuse aerial mycelium which, by producing an extraordinary abundance of appressoria, fastens upon and penetrates into, any host structures it may encounter. It appears, however, to have a more limited range than *P. butleri*, as it is common, in the United States, only in the more southern latitudes.

P. dissotocum approximates more closely than does any of the others to *P. monospermum*, the type of the genus. *P. periilum* and *P. myriotylum* show a greater or lesser development of lobulate elements, and in *P. periplocum* the sporangia are largely composed of these. All these species have smooth oogonia except the last-named, in which they are spiny. The remaining species have spherical to elliptical sporangia, *P. oligandrum* showing signs of an intermediate condition between the spherical and lobulate arrangement. *P. helicoides, P. oedochilum, P. polytylum*, and *P. palingenes* show proliferation of the sporangia after the first-formed one has discharged, as in *P. proliferum*. They have smooth oogonia, whereas those of *P. mastophorum* and *P. polymastum* are provided with spines, as in *P. megalacanthum*.

TAMIYA (H.) & MORITA (S.). **Bibliographie von Aspergillus. 1729 bis 1928.** [Bibliography of *Aspergillus*. 1729 to 1928.]—*Bot. Mag.*, Tokyo, xliv, 523, pp. 375–386; 524, pp. 421–431, 1930.

An alphabetical list is given of the authors whose works were consulted in the preparation of the bibliography of *Aspergillus* from 1729 to 1928 [*R.A.M.*, ix, p. 685], with the date of publication in each case.

GULYÁS (A.). **A dohánylevél barnafoltosságát okozó gomba ökologiája.** [Ecology of the fungi causing brown spots of the leaves of Tobacco.]—*Kisérletügyi Közlemények*, xxxiii, 2, pp. 279–302, 9 figs., 1930. [German summary.]

The author states that during the year 1926–7 extensive and considerable damage was done to tobacco crops in Hungary by a fungus of the *Alternaria* type causing brown spots on the leaves; the disease again reappeared in 1929, but was somewhat less destructive than in the previous outbreak. It was chiefly prevalent

on the Hungarian tobacco varieties Tiszai, Kapa, and Debrezin, but some other varieties also suffered from it. The fungus appears to establish itself primarily on weakened leaves which have lost some of their turgor, from which it then spreads to normal leaves. Insects, e.g., species of *Thrips* and aphids, are believed to be contributory factors in the distribution of the disease.

The disease is stated to have been first recorded in 1902 from Hungary, Galicia, and Dalmatia by Preissecker, who attributed it to *A. brassicae* var. *tabaci*. A detailed morphological study of the fungus, however, showed that it is identical with *Macrosporium tabacinum* [*R.A.M.*, vi, p. 130], a species which the author considers to belong to the genus *Alternaria* and which is accordingly renamed *A. tabacinum* (Ell. & Ev.) Gulyás [but cf. *A. tabacina* (Ell. & Ev.) Hori 1908].

HOLMES (F. O.). **Local and systemic increase of Tobacco mosaic virus.**—*Amer. Journ. of Botany*, xvii, 8, pp. 789–805, 2 figs., 1930.

Continuing his studies on the virus of tobacco mosaic [*R.A.M.*, viii, p. 532], the writer determined, by means of measurements on *Nicotiana glutinosa*, the concentrations of virus in portions of inoculated plants of Turkish tobacco (*N. tabacum*).

The results of the investigations [which are fully discussed and tabulated] showed that the virus developed to a high concentration near the site of inoculation in a tobacco leaf before reaching measurable concentrations in other parts of the inoculated leaf or elsewhere in the plant. A slow spread of virus through the tissues of the inoculated leaf accompanied the increase in concentration near the site of inoculation, this being apparently independent of the rapid movement carrying the virus to distant parts of the plant. The local increase and slow spread of the virus constitute a local or primary phase of the disease.

The systemic or secondary phase of tobacco mosaic was characterized by the almost simultaneous appearance of increasing quantities of virus in the petiole of the inoculated leaf, in all parts of the stem, in the developing top leaves, and in the root, with subsequent invasion of the older leaves. In a series of plants all successfully inoculated through similar leaves at the same time, the local increase of virus within the tissues of the inoculated leaf blade occurred simultaneously in all the plants; the systemic spread of the virus, however, with its attendant mottling of developing leaves, took place early in some individuals and late in others.

ERVEN (H.). **Die Streifen- und die Sklerotienkrankheit der Tomate, zwei für Deutschland neue Krankheiten.** [The streak and sclerotial diseases of the Tomato, two diseases new to Germany.]—*Obst- und Gemüsebau*, lxxvi, 11, pp. 180–181, 2 figs., 1930.

Popular notes are given on two diseases of tomatoes recently observed in the Crefeld district but not previously known to occur in Germany, viz., streak (*Bacillus lathyri*) [but see *R.A.M.*, ix,

p. 74], and sclerotial disease [fungus not specified]. Considerable damage has been caused by the former disease, which destroyed 20 per cent. of the crop in one greenhouse in 1929.

VALLEAU (W. D.) & JOHNSON (E. M.). **Some possible causes of streak in Tomatoes.**—*Phytopath.*, xx, 10, pp. 831–839, 1930.

A study has been made at the Lexington (Kentucky) Experiment Farm on the possibility of inducing streak in tomatoes [*R.A.M.*, x, p. 64] with various tobacco viruses [ibid., x, p. 60], both in combination with and without the so-called healthy potato virus. The disease was produced by an unmixed virus, apparently belonging to the true tobacco mosaic group, and termed ring mosaic on account of the tendency of the mosaic mottling to appear in the form of rings; by three other strains of the true tobacco mosaic viruses plus the healthy potato virus; by three strains of the cucumber mosaic viruses plus the healthy potato virus; and by three strains of the etch virus plus the healthy potato virus. Veinbanding plus healthy potato virus did not produce streak and certain combinations without healthy potato virus also gave negative results. The virus strains within a given virus group differ primarily in the severity of the symptoms produced on a given host. In the three virus groups under investigation, the one in each group producing the most virulent symptoms on tobacco resulted in the most severe streak of tomatoes when combined with the potato virus.

SIBILIA (C.). **La moria degli Olmi in Italia.** [Die-back of Elms in Italy.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 2, pp. 281–283, 1930.

In June, 1930, from an examination of diseased material [which is described] the author established the presence of the Dutch elm disease due to *Graphium ulmi* on elms in the vicinity of Modena. Until quite recently the disease was unknown in Italy, where, up to the present, only *Ulmus campestris* appears to be affected.

WOLLENWEBER (H. W.) & RICHTER (H.). **Stand des 'Ulmensterbens' im Jahre 1930 in Deutschland.** [Status of the 'die-back of Elms' in the year 1930 in Germany.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 10, pp. 83–84, 1 fig., 1 map, 1930.

Most of the information in this paper on the varietal reaction of elms in Germany to the dying-off caused by *Graphium ulmi* has already been noticed from another source [*R.A.M.*, ix, p. 499]. *Ulmus fulva*, *U. montana*, and *U. effusa* are all susceptible to the disease, though less so than *U. americana* and *U. campestris*. The highly resistant *U. vegeta* may be recommended for planting on an extensive scale in public gardens, parks, and roadways. Two species of the related genus *Celtis*, viz., *C. australis* and *C. orientalis*, appear to be immune. The apparently complete recovery from dying-off observed in a number of young trees (a phenomenon never observed in older ones) was found not to be due to any

inherent development of immunity, since reinoculation with *G. ulmi* produced the typical symptoms of the disease in these trees.

SCHWARTZ (G.). **Tätigkeitsbericht der Hauptstelle für gärtnerischen Pflanzenschutz Pillnitz im Jahre 1929.** [Report on the work of the headquarters of horticultural plant protection at Pillnitz in the year 1929.]—Reprinted from *Sächs. Gärtnerbl., 1930,* 7–8, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 8–14, p. 268, 1930.]

The die-back of elms in Saxony [*R.A.M.*, x, p. 138 and preceding abstract] is attributed primarily to a sinking of the ground water level and defective soil aeration; *Graphium ulmi, Myxosporium,* and other fungi were found only in a small percentage of the trees examined.

PAILLOT (A.). **Les traitements insecticides et anticryptogamiques des Noyers.** [The insecticidal and anticryptogamic treatments of Walnuts.]—*Comptes rendus Acad. d'Agric. de France,* xvi, 26, pp. 885–889, 1930.

Good results in the control of fungous and insect pests of walnut trees have been obtained in the Rhône Department (France) by three applications of Bordeaux mixture (1 per cent. copper sulphate and 1 per cent. hydrated lime with the addition of lime arsenate or lead arsenate), the first given on 13th June, the second on 24th June, and the third on 8th July. It is recommended that a winter treatment of mineral oil-emulsion in Bordeaux mixture be given every two to three years.

SMITH (C. O.) & BARRETT (J. T.). **Some inoculations of Juglans with Phytophthora-like fungi.**—Abs. in *Phytopath.*, xx, 10, pp. 849–850, 1930.

Black walnuts (*Juglans hindsii* and *J. californica*) used in California as stocks for the English walnut (*J. regia*) may be attacked by crown rot due either to a species of *Phytophthora* resembling *P. cactorum* or to one of the *Pythiacystis* type [*R.A.M.*, viii, p. 550; ix, p. 567]. The disease may spread up the English walnut trunk for a distance of several feet. Mycelium and oospores were observed on rotted bark of *J. regia* wrapped for five days in paraffin paper. Artificial inoculation tests showed that *J. californica* is the most susceptible variety (80 per cent. infection from 253 inoculations); *J. hindsii* showed 50 per cent. from 350 inoculations and *J. regia,* in marked contrast to its apparent resistance in the field, 82 per cent. from 209. On the English walnut the lesions are much smaller than those on *J. californica,* which have been known to reach the size of 60 or 90 inches in a year on certain mature individuals. *J. sieboldiana, J. nigra, J. major,* and the Mexican *J. pyriformis,* as well as almond, peach, sweet cherry, pear, plum, and lemon, are susceptible to artificial inoculation by the walnut fungus. Cultures of *P. cactorum* from various sources and hosts produced typical crown rot symptoms on inoculation into *J. californica.*

BRITON-JONES (H. R.) & MARSHALL (R. C.). **Observations on Cypre (Cordia alliodora L.) in Trinidad with special reference to canker disease (Puccinia cordiae (P. Henn.) Arthur).** —*Mem. Imp. Coll. Trop. Agric. Trinidad* (Mycol. Ser.) 3, 8 pp., 2 pl., 1930.

In the mycological part of this paper [by Briton-Jones] an account is given of a canker disease associated with *Puccinia cordiae* which in recent years has caused much damage to young plantings of cypre (*Cordia alliodora*) in Trinidad. In previous records of this fungus some confusion has prevailed, whether as regard host, parasite, or symptoms. From a review of the relevant facts it is concluded that the fungus should be known as *P. cordiae* (P. Henn.) Arthur, with *P. corticola* Arthur & Rorer and *Uredo cordiae* Henn. as synonyms.

The author's observations showed that the witches' brooms sometimes attributed to the fungus were present on every cypre tree examined, whether cankered or not, the condition invariably being accompanied by insect infestation.

The cankers may, exceptionally, occur on young green shoots; cankers bearing teleutospores are present on upright, unbranched shoots but are most frequent on the bases of the branches forming the witches' brooms. The growth of *P. cordiae* on the host branches is slow, and the stem swells on the side not attacked. As the branch becomes older the advance of the fungus is cut off by callus formation and this results in an open wound. When the small cankers are sufficiently numerous they cause a general dying-back of the younger branches. Large cankers present on the trunks sometimes exceed four feet in length, and, though usually confined to one side, sometimes coalesce and girdle the trunk, in some instances killing the tree. Only the initial stage of the disease is caused by *P. cordiae*, the rest of the damage being due to secondary wood-rotting fungi, of which the first follower is a species of *Fusarium*.

Usually the teleuto stage is most commonly found on the branches, as well as on the leaf veins and laminae. The spores measured from 27 to 48 by 18 to 30 μ. The sori were often confluent and grouped in few or large numbers according to the age of the canker. In two localities the *Uredo* stage was found and *Tuberculina vinosa* Sacc. was also observed parasitic on the rust.

The most severe damage is caused by the permanent cankers on the main trunk, as those on the branches become periodically pruned off as the tree grows higher. The distribution of the disease is correlated with high atmospheric humidity and under Trinidad conditions cypre should be planted in sunny, airy situations, precautions being taken to avoid overcrowded growth in the first few years.

SREENIVASAYA (M.). **Masking of spike-disease symptoms in Santalum album (Linn.).**—*Nature*, cxxvi, 3190, p. 957, 1930.

Certain stocks of sandal (*Santalum album*) were found to show no signs of spike disease [*R.A.M.*, x, p. 70] for long periods, and were therefore believed to represent resistant varieties. Such

individuals were found to be non-infective in transmission experiments conducted with the leaf on susceptible stocks. The accidental injury of two of these trees—in one case by a borer and in the other by wind, both involving the removal of much foliage—led to the development of the typical spike symptoms within 15 days. The possibility was thus suggested of accelerating the manifestation of pathological symptoms by defoliation and light pruning, a practice which has met with great success. In one instance the infected stock remained apparently healthy for 417 days, but in the course of 16 days after light pruning and defoliation the typical spike disease symptoms were exhibited.

In diseased forest areas, therefore, the external appearance of sandal is not the true criterion of its freedom from infection, which manifests itself, if dormant, on pruning the plant. This masking of the spike symptoms appears to be influenced by intense sunshine and temperature. During the masked period the virus appears to be localized in the phloem tissues, where it multiplies and exists in a highly virulent form.

Goodding (L. N.). **Didymosphaeria oregonensis, a new canker organism on Alder.**—Abs. in *Phytopath.*, xx, 10, p. 854, 1930.

The name *Didymosphaeria oregonensis* is proposed [but without description or diagnosis] for a fungus which has been found associated with a canker of living alder in the Pacific Northwest. The distribution of the new species is given as western Oregon and Washington.

Lebedeff (V. I.). Поражение пиловочных бревен синевой и меры устранения такого явления. [Infection of sawmill logs with blue stain and measures for the prevention of this phenomenon.]—Pamphlet issued by *Сев. Краев. Инст. Промышленных Изысканий.* [*North Regional Inst. Industrial Research*], Archangel, 15 pp., 1930.

The author states that one of the most serious troubles affecting the export of sawn timber from Russia is blue stain caused by the composite species *Ceratostomella pilifera* [cf. *R.A.M.*, x, p. 143] which is responsible for from 40 to 70 per cent. of the total of the claims that arise out of defective deliveries. A detailed investigation [some particulars of which are given] indicated that infection of the logs does not occur in the forests, since the trees are felled during winter, when the fungi are in an inactive state. The first signs of infection usually appear while the logs are floating down from the forests to the sawmills, in those portions that are not submerged, and the trouble attains its full development during the interval that elapses between the landing and stacking up of the logs and the sawing process, chiefly owing to unsatisfactory conditions of stacking. Much of the infection may be avoided by constructing the log trains or rafts in such a way that the more valuable logs should be completely submerged in water, and by keeping them so submerged as long as feasible, and then by stacking them up so as to ensure a free circulation of air below and inside the stacks. Directions are given for the construction of the log trains and piles, and the author recommends that the landing of

timber from the river should be avoided during July, August, and September when infection is mostly to be feared.

DARROW (G. M.) & DETWILER (G. B.). **Currants and Gooseberries: their culture and relation to White Pine blister rust.**—*U.S. Dept. of Agric. Farmers' Bull.* 1398, 38 pp., 26 figs., 2 maps, 1930.

This is a revised account of the authors' previous notes on the relation of currants and gooseberries to white pine blister rust [*Cronartium ribicola*: *R.A.M.*, iv, p. 100], the legislation concerning which is summarized to date. White pines in nurseries should be safeguarded by the eradication of black currants within a one-mile radius, and of other currants and gooseberries within 1,500 ft. [cf. ibid., ix, p. 8].

SCHMITZ (H.). **A suggested toximetric method for wood preservatives.**—*Indus. & Engin. Chem., Analyt. Ed.*, ii, 4, pp. 361–363, 1930.

In conjunction with fourteen other investigators [whose names are given], the writer has prepared the following statement regarding a proposed toximetric method for wood preservatives.

Different species of wood-destroying fungi, and even different strains of the same fungus, vary greatly in their resistance to toxic agents. Thus it is imperative, in order to obtain comparable results in toxicity tests by different workers, to use cultures of the same test fungus. A strain of *Fomes annosus*, isolated from mine timber and distributed by the Office of Forest Pathology, Forest Products Laboratory, Madison, Wisconsin, has been used for most of the toxicity tests in the United States [*R.A.M.*, viii, p. 689; ix, pp. 619, 692] and the continued use of this strain is advised. Where the use of additional fungi is desirable the following are recommended: *Lenzites trabea*, *Lentinus lepideus*, *L. sepiaria*, *Poria incrassata*, *Coniophora cerebella*, *Polyporus vaporarius* [*Poria vaporaria*], *Polystictus versicolor*, *P. hirsutus*, and *Trametes serialis*.

The influence of a toxic material on the test fungus may be evaluated by (*a*) its effect at a given concentration on the growth rate, (*b*) the concentration of preservative in the nutrient medium necessary completely to inhibit growth, or (*c*) the concentration necessary to kill the inoculum in a given length of time. It is recommended that both (*b*) and (*c*) be determined in the evaluation of the toxicity of wood preservatives, the length of time specified for (*c*) being 14 days.

In the interpretation of the toximetric values of wood preservatives due consideration must be given to the following facts. (1) The higher the percentage concentration required for the complete inhibition of growth and destruction of the test fungus, the lower is the toxicity of the preservative. (2) Toximetric values are not in themselves an index of the wood-preserving value of the substance tested. (3) Other factors, e.g., leaching, volatility, chemical stability, penetrability, cost, cleanliness, and the like, must all be considered in the final evaluation of a wood preservative.

An agreement has been reached to follow, in a general way, the method developed and now used by the Office of Forest Pathology. This method [full details of which are given] involves the use of a preservative-nutrient agar mixture or emulsion. The agar agreed upon consists of Difco bactoagar, 15 gm.; Trommer's extract of malt, 25 gm.; and distilled water, 1,000 c.c., and the preservative is added after sterilization at 10 lb. pressure for 20 minutes. Approximately 25 gm. of the mixture are placed in each Petri dish and inoculated with mycelium from 14-day-old cultures of the test fungus. The test plates are incubated for 14 days at 28° C., the amount of radial growth being measured daily for 6 days and every other day from 7 to 14 days, at the end of which period the inoculum is transferred to standard malt agar slants for 14 days to determine if it is dead or alive. It is recommended that the results of the tests by the above toximetric method be stated for both total inhibition and killing point in terms of the percentage of preservative used in the medium.

Van Poeteren (N.). **Bestrijding van de knolvoetziekte bij Kool.** [Control of the club-root disease in Cabbage.]—*Tijdschr. over Plantenziekten*, xxxvi, 10, pp. 256–260, 1930.

This is a summary of Wellman's recent investigations on the control of club-root of cabbage (*Plasmodiophora brassicae*) in the United States by the application of lime to the soil [*R.A.M.*, ix, p. 693].

De Andrés (C. G.). **Notas sobre la hernia de la Col.** [Notes on club-root of Cabbage.]—*Bol. Pat. Veg. y Ent. Agric.*, iv, 15–18, pp. 98–104, 3 figs., 1929. [Received December, 1930.]

Popular notes are given on the symptoms, mode of infection, and control of club-root of cabbage (*Plasmodiophora brassicae*), which is stated to be frequently confused in Galicia (Spain) with the injuries caused by the insect *Ceutorrynchus pleurostigma*. Of all the methods of treatment tested, triennial crop rotation, coupled with thorough eradication of weeds, gave the best results.

Hülsenberg (H.). **Ueber eine verbreitete Krankheitserscheinung an Zuckerrüben in der Provinz Sachsen im Jahre 1930.** [On a widely distributed pathological phenomenon in Sugar Beets in the Province of Saxony in the year 1930.]—*Deutsche Zuckerind.*, lv, 40, pp. 1079–1080, 3 figs., 1930.

A brief account is given in popular terms of a disease of sugar beets occurring in various parts of Saxony during the summer of 1930. The outer leaves of the plants were dead, and some of the older ones showed dry, brown to black spots on the margins and intercostal areas; these symptoms were accompanied by undulations recalling those of Savoy cabbage leaves. A black discoloration developed in the vascular bundles 10 to 20 minutes after sectioning the roots of diseased plants. The disease is believed to be identical with the gummosis described by Busse (*Zeitschr. für Pflanzenkrankh.*, vii, pp. 65, 149, 1897), and is probably closely correlated with climatic conditions.

BREMER (H.). **Die Fettfleckenkrankheit der Bohnen.** [The grease spot disease of Beans.]—*Obst- und Gemüsebau*, lxxvi, 10, pp. 156–157, 7 figs., 1930.

The grease spot disease [*Bacterium medicaginis* var. *phaseolicola*] of beans [*Phaseolus vulgaris*], first observed in Germany in 1927 [*R.A.M.*, ix, p. 696], has extended considerably during 1930 and appears to be of a highly infectious character. The disease spreads in patches from a single plant, evidently infected through the seed, and is subsequently disseminated over the entire field by rain, wind, human and animal agency, and the like. Brief notes are given on the symptoms of grease spot and on varietal reaction to the disease, which occurred in 1930 on Hinrichs Riesen (wax and mixed stringless), Dattel, Flageolet (white), Johannisgold, Goldperle, Rheingold, stringless Zuckerbrech, Flageolet St. Andreas, and Red Paris Flageolet.

MACHACEK (J. E.). **The stem spot of Onions.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants, 1928–1929*, pp. 58–64, 3 figs., 1929. [Received November, 1930.]

Late in the wet summer of 1928, the author observed a destructive stem spot disease on the seed stalks of onions which had made a good recovery from downy mildew (*Peronospora schleideni*) [*R.A.M.*, x, p. 7]. The disease subsequently attacked the healthy portions of the same stems, which broke down under the weight of the head, sometimes before the seed had ripened, as well as other stems not previously mildewed.

The initial symptom consisted in the formation of an irregular, oval, pale green, sunken spot, generally at or above the swollen part of the stem. Soon after the formation of the lesions, conidia of *Macrosporium parasiticum* [ibid., vii, p. 701] were produced in distinct, dark, concentric rings on the surface. The perithecial stage, identified as *Pleospora herbarum* [ibid., iii, p. 499] developed early in September, in irregular, concentric circles in the lesions, but after the death of the host they grew irregularly. Asci did not mature in the field, however, till after the following April.

When seed of the susceptible Red Weathersfield and Red Globe varieties was surface-sterilized and plated out on potato-dextrose agar no fungal growth took place, indicating that the fungus is not carried internally on the seed, though a further test showed it to be carried externally. It was not found to cause a damping-off of onion seedlings, nor was it responsible for any storage rot of bulbs.

Control is recommended by improved field sanitation and spraying with Bordeaux mixture. To obviate loss the seed should be harvested as soon as ripe.

WICHMANN. **Ursache, Verbreitung und Bekämpfung der Mosaikkrankheit des Spinats.** [Cause, distribution, and control of the mosaic disease of Spinach.]—*Obst- und Gemüsebau*, lxxvi, 10, pp. 160–161, 1 fig., 1930.

Brief, popular notes are given on the etiology and control of the mosaic disease of spinach which caused such heavy damage in the Bonn district during the late autumn of 1929 [*R.A.M.*, ix, p. 428].

WILSON (J. D.) & NEWHALL (A. G.). **The control of Celery blights.** —*Ohio Agric. Exper. Stat. Bull.* 461, 30 pp., 5 figs., 1930.

Brief descriptions are given of the three leaf diseases, namely, late blight (*Septoria apii*), early blight (*Cercospora apii*), and bacterial blight (*Bacterium apii*) to which celery is stated to be susceptible in Ohio, and of which the first-named is by far the most prevalent and serious in that State. The causal organisms overwinter in celery refuse and the lack of crop rotation ensures a plentiful source of inoculum each year. Long periods of rainy weather favour the diseases, the severity of which is chiefly governed by weather conditions.

A detailed account is given of control experiments over four years in different localities of northern Ohio, brief references to which have already been noticed [*R.A.M.*, vi, p. 10; viii, p. 757]. The best results, both in the seed-bed and in the field, were obtained with 5–5–50 or 5–7½–50 Bordeaux mixture spray or with 20–80 monohydrated copper sulphate-hydrated lime dust, the two methods being almost equivalent in efficacy, with a slight advantage, if any, in favour of the spray. The addition of oil spreaders to Bordeaux mixture did not materially increase its efficacy. Freshly home-mixed dusts were slightly more effective than similar commercial dusts, and had the advantage of being considerably cheaper. The substitution of inert materials, such as kaolin or infusorial earth, for part of the lime in the 20–80 copper-lime dust did not improve the efficacy of the latter, but somewhat influenced the flowing and adhesive qualities of the dust. Although an increase in the metallic copper content of the dust over the usual 7 per cent. somewhat increased its efficacy, the practical results obtained did not appear to warrant the higher cost of such dusts. None of the other dusts tested, in which copper was present in a different form, was as effective as the standard 20–80 copper-lime mixture.

Spraying or dusting the plants in the seed-beds several times is strongly recommended, in order to avoid creating infection foci in the fields by transplanting diseased seedlings. The latter should not be left in the seed-beds longer than is absolutely necessary, since infection under the crowded conditions in the seed-bed may become severe in spite of all precautions. Mulches of garbage, rotted straw or manure, and more particularly of paper, were shown to be effective in reducing the amount of blights in the fields. Treatment of the soil between the celery rows with copper sulphate or mercuric chloride solutions had no material controlling effect. The use of disinfected seed or of seed two or more years old reduced the incidence of the diseases in uninfected soil, but did not guarantee the non-appearance of blights in the fields. It was also noticed that in celery rows planted in an east to west direction, the leaves on the north side were more severely attacked than those on the south side, this suggesting a relation between light intensity and the length of time during which the leaves remain wet, on the one hand, and the degree of infection, on the other.

Spraying was cheaper than dusting, but the advisability of adopting one or the other of the two methods depends entirely on local conditions.

VOGLINO (P.). **Le macchie livide della Vita. (Ascochyta ampelina Sacc.).** [Livid spots on Vine. (*Ascochyta ampelina* Sacc.).]—*La Difesa delle Piante*, vii, 5, pp. 1–3, 1930.

Early in the wet, misty summer of 1930, when sudden changes of temperature were frequent, a serious wilt of vines was reported from the vicinity of Susa, northern Italy, marked by livid, brown, sunken spots on the herbaceous branches, especially at the apical internodes, which were softened and as if carbonized. Some of the branches bore *Gloeosporium ampelophagum*, while at the base of one internode pycnidia of *Ascochyta ampelina* were observed.

The subepidermal, dark, spheroidal or somewhat obtuse pycnidia of *A. ampelina* occur mostly in clusters of 3 to 4 or in longitudinal series of 4 to 7, and measure 100 to 210 μ in diameter. In wet weather the hyaline spores are released from the ostiole in a thick, yellowish cirrhus; they are ellipsoidal, elongated, rounded at the apex and truncated at the base in continuation of a cylindrical conidiophore which measures 5 to 8 by 4 to 5 μ, and are divided by a median septum into two loculi; they are seldom biseptate, and measure 10 to 15 by 3·5 to 5 μ. These spores on germinating may give rise to secondary conidia measuring 6 to 8 by 5 μ, or to short chains of thick loculi, which produce new hyphae.

Artificial inoculation of green vine branches gave negative results, and it is concluded that *A. ampelina* can only be capable of parasitic action when the vines are weakened by unfavourable weather.

BILLEAU (A.). **Un cas d'esca (Stereum necator) sur des jeunes souches de Vigne de deux ans.** [A case of esca (*Stereum necator*) on young two-year-old Vine stocks.]—*Ann. Inst. Recherches Agron. de Roumanie*, i, pp. 280–281, 1930.

Attention is drawn to the occurrence of the 'esca' disease (*Stereum necator*) on two-year-old Aligoté vine stocks at the Viticultural Experiment Station, Chișinaŭ, Rumania, in 1930 [*R.A.M.*, x, p. 77]. The leaves showed the typical yellowish stripes, later turning the colour of a dead leaf, between the veins, and the fungus was detected in the blackened tissues of the stock. Contrary to the general opinion, therefore, *S. necator* is evidently capable of attacking young vines as well as older ones. The latter (15 to 18 years old) are stated to be extensively affected at the Station.

BENLLOCH (M.). **Algunos casos dudosos en la patología de la Vid.** [Some doubtful cases in the pathology of the Vine.]—*Bol. Pat. Veg. y Ent. Agric.*, iv, 15–18, pp. 112–116, 1929. [Received December, 1930.]

A brief discussion is given on the etiology of some obscure vine diseases occurring in Spain, viz. rougeau, which may be of physiological origin [*R.A.M.*, viii, p. 484] or due to *Pseudopeziza tracheiphila* [ibid., viii, p. 701]; apoplexy or esca (*Stereum hirsutum* or *S. necator*) [ibid., viii, p. 222; and preceding abstract], the symptoms of which may also be simulated by a non-parasitic disturbance known to French growers as 'folletage'; court-noué [ibid., x, p. 77]; and the so-called 'asparagus' disease, characterized

by an abnormal development of long, slender, tangled roots recalling those of the asparagus plant, and occurring in low, humid situations.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1929.** [Review of phytopathological records in 1929.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 1, pp. 1–43, 2 figs., 1930.

In this report, which is on similar lines to those for previous years [cf. *R.A.M.*, viii, p. 546], the diseases dealt with are grouped according to the hosts affected, which are divided into two main sections, woody and herbaceous plants, the former including vine, olive, citrus, mulberry, and other fruit trees, forest trees, and woody ornamental plants, and the latter cereals, forage crops, tomato, chilli pepper (*Capsicum annuum*), vegetable marrows, potato, and some herbaceous ornamental plants.

Describing the effects produced by the weather on the various crops in the period under review, the author states that normal temperatures prevailed during the beginning of the winter of 1928–9, but early in January the cold became intense; towards the end of the month snow and frost became general and persistent, with the result that market garden crops, potatoes, and field crops sustained appreciable injury. The worst period was from 11th to 20th February, when the temperature dropped still further throughout most of the mainland, falling as low as from $-5°$ to $-25°$ C. in many agricultural areas. This exceptional cold came to an end with the close of February.

The vines most resistant to the cold were the American varieties, followed by some of the hybrids with *Vitis vinifera* 'blood'; of the native Italian varieties those with red, hard-skinned berries were comparatively resistant, whereas Barbera and Labrusco, and to a less extent Freisa, were very susceptible. It is estimated that in the Po valley, where the damage was most severe, some 50 per cent. of the vines were affected. In certain localities in the vicinity of Modena 10 per cent. of the vines were killed. Weakening induced by insect attack and unsuitable cultural and soil conditions in some regions caused extensive frost injuries to develop even in vines of varieties known to be most resistant to cold. Generally speaking, the losses were more extensive in the plains than in the hills.

In central Italy 30 per cent. of the olive trees were estimated to be more or less seriously affected by the severe weather, and in some localities 2 per cent. were killed.

Owing to the improved cultural practices now in vogue wheat was very little affected by foot rot [*Leptosphaeria herpotrichoides*, *Ophiobolus graminis*, and *Fusarium* spp.: ibid., viii, p. 163] during the year.

SMARODS (J.). **Kulturaugu slimības 1929. g.** [Diseases of cultivated plants in the year 1929.]—*Acta Inst. Defens. Plantarum Latviensis*, i, pp. 23–25, 1930.

Notes are given on some common fungous diseases affecting economic crops in Latvia during 1929 [cf. *R.A.M.*, ix, p. 226].

SMARODS (J.). **Latvijā novērotās kulturaugiem kaitīgās sēnes.** [Parasitic fungi on Latvian cultivated plants.]—Reprinted from *Lauksaimniecības Mēnešraksts*, 10, 31 pp., 1930.

An annotated list is given of fungi causing damage to the cereal, vegetable, fruit, and miscellaneous crops in Latvia.

SIMMONDS (J. H.). **Report of the Plant Pathologist.**—*Ann. Rept. Queensland Dept. of Agric. & Stock for the year 1929–1930*, p. 67, 1930.

Brief notes are given on investigations conducted in Queensland during the period under review into a number of plant diseases, including flag smut of wheat [*Urocystis tritici*: *R.A.M.*, ix, p. 769], maize cob rot and root rot (*Diplodia zeae*) [ibid., ix, pp. 175, 713, 773], banana leaf spot (*Cercospora*) [*musae*: ibid., viii, p. 255], pineapple water blister (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., viii, p. 733], black spot of citrus (*Phoma citricarpa*) [ibid., ix, p. 450], and brown spot (*Macrosporium* sp.) and scab (*Cladosporium* sp.) of passion fruit [*Passiflora edulis*].

SHARANGAPANI (S. G.). **Appendix I. Annual Report of the Economic Botanist to the Government of Bengal for the year 1929–30.**—*Ann. Rept. Dept. of Agric. Bengal for the year 1929–30*, pp. 37–46, 1930.

The following references of phytopathological interest occur in this report. Further investigations were made on the betel vine [*Piper betle*] disease associated with *Phytophthora*, *Sclerotium*, and *Rhizoctonia* spp. [*R.A.M.*, ix, p. 431]. Promising results were given by the application of 1 per cent. resin-Bordeaux mixture, which considerably reduced the incidence of the first-named organism.

Grapefruits at Dacca Farm were attacked by *Pythiacystis* [*Phytophthora citrophthora*: *R.A.M.*, x, p. 98], which was well controlled by one application of 1 per cent. Bordeaux mixture.

Finger-and-toe disease of cauliflowers [*Plasmodiophora brassicae*] occurred at Darjeeling.

Phoma solani [ibid., v, p. 148] caused considerable damage to brinjal [*Solanum melongena*] plants in the 24-Parganas and Pabna districts. The fungus, which attacked the plants at the collar at flowering time, was checked by the application of Bordeaux mixture.

A species of *Rhizoctonia* was found on groundnut plants at Dacca and Bankura as a sequel to invasion by white ants.

Rice in the Barisal district suffered from 'scorching' of the grain coats associated with a species of *Helminthosporium*.

[SEN (T. N.).] **Appendix I. IV. Mycology.**—*Ann. Rept. Dept. of Agric. Assam for the year 1929–30*, pp. 57–59, 1930.

Collar rot of sugar-cane (*Hendersonina sacchari*) [*R.A.M.*, viii, p. 549] causes heavy losses in Assam, sometimes amounting to 50 per cent. of the crop. By continuous selection of setts for the last two years the incidence of infection has been much reduced and did not exceed 7 per cent. on the Jorhat farm during the period

under review. The sporadic occurrence of mosaic was detected in three sugar-cane varieties, viz. J. 33a, H. 109, and J. 247.

Late blight of potatoes (*Phytophthora infestans*) was controlled on the Upper Shillong farm and elsewhere by spraying with Bordeaux mixture. The Early Market variety was the most severely attacked, little damage being observed on Ben Cruachen 29, Arran Comrade 29, Kerr's Pink, Talisman, and Great Scot 29. *Rhizoctonia* [*Corticium*] *solani* occurred on a few early potatoes, especially Epicure 29 and Eclipse. Bacterial rot (*Bacillus* [*Bacterium*] *solanacearum*) was prevalent on potatoes in allotments at Shillong, and wilt (*Fusarium oxysporum*) was reported from the Surma Valley.

Thielaviopsis [*Ceratostomella*] *paradoxa* [ibid., viii, p. 88] was isolated from areca [*Areca catechu*] palms suffering from bud rot. A species of *Vermicularia* was found to be causing considerable injury to brinjal [*Solanum melongena*] fruits near Jorhat. A species of *Rhizoctonia* destroyed practically an entire plot of cow-peas before remedial measures could be instituted.

Ginger was attacked by *Pythium gracile* [? *P. aphanidermatum*: cf. ibid., vii, p. 488].

MANNS (T. F.) & ADAMS (J. F.). **Department of Plant Pathology.**—*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1930* (*Bull.* 167), pp. 35–44, 1930.

Further tests in the treatment of old sweet potato beds against black rot [*Ceratostomella fimbriata*: *R.A.M.*, ix, p. 228] with formaldehyde solution (1 lb. in 25 galls. water) applied at the rate of one-third gall. per sq. ft., gave tubers (from slip seed) showing from a trace to 0·5 per cent. infection, whereas new, untreated soil gave a clean crop.

Attempts to control stem rot (*Macrosporium* [*Alternaria*] *solani*), nail-head spot (*M. tomato*) [loc. cit.], bacterial fruit spot (*Bacterium vesicatorium*), and late blight (*Septoria lycopersici*) on southern-grown tomato seedlings by dipping the whole plant or the stem and roots only in various fungicides were unsatisfactory. Treatment of tomato seed with ceresan again failed to control *A. solani*; clear evidence was obtained that the disease is sometimes wind-borne.

Promising results were obtained when small amounts of Bordeaux mixture or copper compounds were combined with sulphur sprays or sulphides to control apple scab [*Venturia inaequalis*] while leaving the apples with a good finish. A trace of scab, no russeting, and a very fine finish followed five applications of a mixture of 8 lb. cal-mo-sul, 2 lb. oxo-Bordeaux, and 2 lb. calcium arsenate in water to make 100 galls. or 10 lb. dry mix sulphur lime with 2 lb. each of oxo-Bordeaux and calcium arsenate, per 100 galls.

Greenhouse and field inoculations of Pearl Pink cantaloupe melons with *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., ix, p. 437] obtained from overwintered leaves of cucumber and cantaloupe gave negative results when made on the day when the first trace of natural infection in the field was observed.

Twig cankers caused by *Bact. pruni* [cf. ibid., x, p. 83] collected

from stone fruit trees on 3rd October, 1928, were active, but after that date were dormant until 12th May following. As the cankers mature in the autumn they become delimited by growing tissue. No evidence was obtained that as the tree growth became active in the spring the growth of the cankers extended. On peach the cankers are very shallow and do not become perennial, as on plum; on the former, also, they were never observed to girdle the twig. Parts of the entire twig were killed only when the terminal growth was infected; this is often killed back for one or more inches. Hydrated lime (15 lb. per 50 galls. water) was germicidal to *Bact. pruni* at a dilution of 1 in 700, and, when 0·5 per cent. penetrol was added, at a dilution of 1 in 1,400. Stone lime (10 lb. per 50 galls.) was germicidal to the same organism at a dilution of 1 in 1,050, and its efficacy was not increased by the addition of penetrol. Tests for the control of cankers as a source of spring infection on Elberta peaches were carried out on trees heavily infected for three years, various [named] germicides being compared with the standard sulphur spray schedule for peaches as regards their effectiveness in the prevention of fruit infection with *Bact. pruni*. The best results (11·9, 14·4, and 21·3 per cent. infection, respectively) were given by zinc sulphate dust (20 per cent., three applications during June and July), and by ethyl mercury chloride (2 per cent., 1 lb. per 50 galls. water, applied twice in October and May or May and June). Applications of the standard schedule gave from 12·5 to 45·5 per cent. infection.

Further tests of the efficacy of various sprays against fruit spot of apples (*Phoma pomi*) [ibid., x, p. 36] showed that the least amount of infection (4·3 per cent., on the Stayman variety) followed five applications of colloidal copper (4 lb. per 100 galls.), but the trees receiving this treatment showed 11·8 per cent. scab [*Venturia inaequalis*] and 44·4 per cent. russeting on the fruit. The smallest amount of russeting was 14·4 per cent. on Jonathan apples similarly sprayed with ethyl mercury chloride (1 in 50); this gave 2 per cent. scab and 45 per cent. fruit spot.

Penetrol (0·5 per cent.) used alone as a spray caused a trace of leaf spotting on squash [*Cucurbita* sp.] and soy-bean; in combination with calcium sulphide, Bordeaux mixture, copper oxychloride, and ethyl mercury chloride it caused no injury to these or to cucumbers, cantaloupes, and tomatoes. Calomel (1 in 2,000) and mercutox (1 in 2,000) inhibited the germination of *Sclerotinia fructicola* [*S. americana*] by about 50 per cent., while when penetrol was added, germination was almost nil, as compared with 85 per cent. in the control. Penetrol in combination with spray materials and organic mercury compounds invariably increased the lethal dilution point against *Bact. pruni* and *Bacillus amylovorus*.

TISDALE (W. B.). **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1929*, pp. 68–81, 1929. [Received February, 1931.]

This report contains the following items of interest in addition to those already noticed from other sources. Citrus trees attacked by psorosis [*R.A.M.*, ix, pp. 59, 523] were treated by removing the

loose, scaling bark and lightly scraping off the dark outer portion of the bark well in advance of the lesion, followed by painting with lime-sulphur ($\frac{1}{2}$ lb. dry to 1 gall. water). When applied in time to check the inroads of the disease, the method gave very promising results and proved effective also against gummosis. All attempts to isolate an organism from scaly bark material were unsuccessful.

The best control of citrus melanose [*Phomopsis citri*] was again given by the application of Bordeaux mixture in conjunction with oil 'A' (69 per cent. grade 1 fruit and 24 per cent. infection, compared with 56, 54, and 45 per cent. grade 1 fruit for Bordeaux with oils 'B' and 'C' and oil 'B' alone, with 32, 26, and 42 per cent. infection, respectively).

There was found to be a decided lag period in the growth of *Phytomonas* [*Pseudomonas*] *citri* [ibid., ix, p. 159] in potato broth at 11·5° C., the optimum temperature for development being 28° to 31°. Starch was hydrolysed most rapidly at 28°. In unsterilized sandy soils and sandy soil decoctions, the organism died out in one to five days, whereas in sterilized soil cultures of the same kind it remained viable for 150 days, but not for 200. In unsterilized muck soils *P. citri* died out in 2 to 13 days, while in sterilized samples it lived for at least 150 days.

Studies on *Empusa fresenii*, attacking the citrus aphid [*Aphis spiraecola*: loc. cit.], show that two strains of the fungus exist (+ and −), the mingling of which in the body of the same insect results in the production of the resting spore stage. There is an almost complete replacement of the interior body materials, except muscular tissues, by the fungus, and though death may occur at any time during this process, it is generally delayed until the aphid's body is packed with fungal material. What appear to be two types of hyphal bodies have been detected in dissected aphids and in stained slides. The mature zygospore is very thick-walled and contains half the number of nuclei generally found in the actively growing stages.

Spindle tuber of potatoes [ibid., x, p. 50] was found to be transmissible at planting time by the cutting knife and possibly also by the picker planter. Comparing the yields of spindle and healthy tubers, percentage decreases ranging from 75 to 84 per cent. in prime potatoes and from 17 to 37 per cent. in seconds were recorded for the former class. Seed piece decay was found to be a factor in the development of spindle tuber.

HEALD (F. D.). **Division of Plant Pathology.**—*Fortieth Ann. Rept. Washington Agric. Exper. Stat. for the fiscal year ended June 30, 1930* (*Bull.* 245), pp. 47–50, 1930.

The following fungi have been found by F. D. Heald and G. D. Ruehle to cause decay of varying intensity in cold storage apples: *Mucor piriformis*, *Rhizopus nigricans*, *Pleospora fructicola* (which name is proposed in place of *P. mali* Newton) [since the latter specific name is already occupied: *R.A.M.*, vii, p. 789], *Mycosphaerella tulasnei* (*Cladosporium herbarum*) [ibid., x, p. 193], *Phoma* Nos. 1 and 2, *Coniothyrium* Nos. 1 and 2, *Microdiplodia* spp., *Gloeosporium perennans* [ibid., x, p. 193], *Pestalozzia hartigii*

[ibid., ix, p. 571], *Coryneum foliicolum, Oospora* sp., *Cephalosporium carpogenum*, various species of *Penicillium, Sporotrichum malorum* [ibid., vii, p. 729], *S. carpogenum* n. sp. [but without diagnosis, as are also the other new species and varieties recorded in this list], *Botrytis cinerea, B. mali* n. sp., *Cladosporium malorum* n. sp., *Hormodendrum cladosporioides* [ibid., x, p. 194], *Stemphylium congestum* [ibid., vii, p. 789], *S. congestum* var. *minor* n. var., *Alternaria tenuis, A. mali, A.* spp., *Fusarium* spp., *Ramularia* sp., *R. magnusiana, Epicoccum granulatum*, and *Corticium centrifugum* [ibid., x, p. 38]. Special attention is being paid to the problem of blue mould [*P. expansum* and other species: cf. ibid., viii, p. 50], which is stated to cause heavier losses in stored apples than any of the other fungi concerned.

Further studies by L. K. Jones on the rate of spread of tomato streak again demonstrated the facility with which the disease can be transmitted by cultural methods in the greenhouse [ibid., ix, p. 436]. Careful washing of the hands with soap and water at intervals during pruning was found greatly to retard the rate of spread from one bed to another. The yield of fruit from streak plants was 44 per cent. lower than that from healthy ones. The virus does not appear to persist for any length of time in the soil in the greenhouse beds.

Beet mosaic [loc. cit.] was found to be present (in amounts up to 100 per cent.) in all the seed beet plantings (especially those adjacent to mother beets) in the Mount Vernon area.

Aster [*Callistephus chinensis*] wilt [*Fusarium conglutinans* var. *callistephi*] was severe, causing a complete loss of Early Wonder and Queen of the Market and 50 to 60 per cent. loss of mixed varieties.

The following diseases are new to the State: downy mildew of hops (*Peronoplasmopara* [*Pseudoperonospora*] *humuli*) [ibid., ix, p. 744]; tulip mould or bulb rot (*Penicillium* sp.); watermelon wilt (*Fusarium* sp.), which caused heavy losses in the Pasco region; black spot of peas (*Cladosporium* sp.); and leaf spot (*Phyllosticta narcissi*) of jonquil [*Narcissus jonquilla*].

Kotte (W.). **Über den Einfluss der H-Ionen-Konzentration auf das Wachstum einiger phytopathogener Bakterien.** [On the influence of the hydrogen-ion concentration on the growth of some phytopathogenic bacteria.]—*Phytopath. Zeitschr.*, ii, 5, pp. 443–454, 5 graphs, 1930.

The writer describes his tests to determine the influence of the hydrogen-ion concentration of the medium (beef bouillon) on the growth of four phytopathogenic bacteria which are of great importance in Germany at the present time, viz., *Bacterium tabacum* [*R.A.M.*, x, p. 53], *Phytomonas* [*Bact.*] *medicaginis* var. *phaseolicola* [ibid., x, p. 5], *Pseudomonas endiviae* [ibid., ix, p. 503], and *Aplanobacter michiganense* [ibid., x, p. 53].

The following minimum, optimum, and maximum values were obtained, respectively: *Bact. tabacum*: P_H 4·6 to 5, 6·7 to 7·1, 9·2 to 9·4; *Bact. medicaginis* var. *phaseolicola*: P_H 5 to 5·35; 6·7 to 7·35; 8·8 to 9·2; *P. endiviae*: P_H 5 to 5·35, 6·85 to 7·1, 9·2 to 9·4; and *A. michiganense*: P_H 5 to 5·35, 7·45 to 7·7, 8·8 to 9·2. No correlation could be discerned, on the basis of these data, between

the occurrence of the bacteria and the existence of an abnormal soil reaction, and it therefore seems unlikely that they can be controlled by attention to this factor.

HILGENDORFF (G.). **Über die Bestimmung des Beizbelages an trockengebeiztem Getreide (II).** [On the determination of the degree of incrustation of the disinfectant on dusted seed-grain. (II).]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 12, pp. 99–100, 1930.

Continuing his investigations on the degree of incrustation of disinfectants on dusted seed-grain [*R.A.M.*, ix, p. 707] the writer devised a method applicable to the testing of organic mercury compounds, represented by ceresan.

A sample (100 gm.) of seed-grain, dusted at the rate of 100 gm. per cwt. (0·2 gm. per 100 gm.) is repeatedly shaken up with ether to remove the dust, which is recovered on filtering through a Gooch crucible [ibid., ix, p. 707]. The crucible is then ignited for 45 minutes and weighed. A comparable sample of the seed before disinfection is treated in the same way. The amount of disinfectant dust adhering to the grain is calculated from the ignition residue of the treated grain, less that of untreated grain, and expressed as a percentage of the ignition residue of 0·2 gm. of the dust itself. This percentage must be increased by the figure 11 as determined by an experiment to test the reliability of the method.

GILJAROVSKIJ (N.) & ZAK (G.). **Die physiologischen Ursachen der Widerstandsfähigkeit des Sommerweizens gegen Steinbrand (Tilletia tritici Wint.).** [The physiological causes of the resistance of summer Wheat to bunt (*Tilletia tritici* Wint.).]—*Naučno-Agron. Ž.*, vii, p. 378, 1930. (Russian.) [Abs. in *Fortschr. der Landw.*, vi, 3, pp. 106–107, 1931.]

The correlation between energy of growth, acidity, and osmotic pressure of the cell sap on the one hand, and reaction to bunt (*Tilletia tritici*) [*T. caries*] on the other, was tested in a number of common and durum wheats [cf. *R.A.M.*, ii, p. 361]. Resistance was found to increase parallel with energy of growth, coinciding with the shifting of the hydrogen-ion concentration towards the alkaline side and the rise in osmotic pressure. The lowest degree of resistance was found where all three factors were unfavourably balanced, but the adverse adjustment of one of the three did not necessarily connote susceptibility. The superior resistance generally associated with the durum types [ibid., ix, p. 368] is presumably attributable to the higher P_H value of their cell sap and higher osmotic pressure.

HASKELL (R. J.), ROSE (R. C.), BRENTZEL (W. E.), WALKER (E. A.), & KIDDER (W.). **Why so much smut in spring Wheat? The results of the 1930 survey to collect information on the prevalence of stinking smut or bunt and methods of seed treatment followed in selected spring Wheat counties.**—*Plant Disease Reporter, Supplement* 77, pp. 96–139, 7 pl., 4 graphs, 1 map, 1930. [Mimeographed.]

Full details are given of an examination, made during the

summer of 1930, of 814 wheat fields comprising 66,729 acres in 17 counties of Minnesota, the Dakotas, and Montana, to determine the reasons for the increasing prevalence of bunt [*Tilletia caries* and *T. foetens*].

It was estimated that 62 per cent. of the spring, and 92 per cent. of the winter wheat growers treated their seed-grain. The average percentages of bunt were as follows: spring wheat treated 2, untreated 4, total 2·8; winter wheat treated 5·9, untreated 24·8, total (110 fields in Montana) 7·4. Formaldehyde was used on 74 per cent. of the spring wheat and 25 per cent. of the winter, the corresponding figures for copper carbonate being 20 and 55 per cent., respectively. The percentages of bunt in spring wheat following the different treatments were: copper carbonate containing 50 per cent. copper with machine, 0·3; 20 per cent. commercial copper carbonate with machine, 0·5; formaldehyde with machine, 0·9; 20 per cent. copper carbonate with home-made machine, 1·1; ceresan with machine, 1·3; ceresan shovelled, 1·3; formaldehyde dip, 2·0; formaldehyde sprinkle, 2·1; 50 per cent. copper carbonate shovelled, 3·2; and 20 per cent. copper carbonate shovelled, 4·6. In winter wheat the degree of control was approximately the same. Farmers who treated their seed-grain every year had only 1·4 per cent. bunt compared with 4·7 per cent. in the stands of those who neglected this practice. The leading spring wheats showed the following percentages of bunt in untreated fields: Ceres 9, durum 7, Marquis 4, Ruby 2·2, Marquillo trace, all hard, red spring wheats 2·7, and all durums 2·9 [*R.A.M.*, ix, p. 367].

A number of recommendations arising out of these observations are made. Copper carbonate dusts (50 or 20 per cent.) applied with good commercial or home-made machines, appear to be the most satisfactory treatment. They are dearer than formaldehyde (40 cents' worth of which will treat 50 bushels of seed-grain compared with 8 bushels for copper carbonate to the same value), but have the advantage of preventing recontamination of the seed-grain. Good control of bunt may be obtained by the application of formaldehyde with machines that remove the bunt-balls, though this treatment is liable to impair germination. Ceresan is more expensive and somewhat less effective than copper carbonate, but it gave moderately good control without affecting germination. On no account should the dusts be applied by the shovelling method.

MEYER-BAHLBURG [W.]. **Kann man flugbrandkranken Weizen aussäen?** [Can Wheat infected by loose smut be sown?]—*Deutsche Landw. Presse*, lvii, 44, p. 608, 1930.

The writer does not agree with a recent recommendation in the *Deutsche Landwirtschaftliche Presse* against the use of seed wheat from fields with loose smut [*Ustilago tritici*: cf. *R.A.M.*, ix, p. 86], since the occurrence of an epidemic is much more dependent on weather conditions at flowering time than on the presence of smutted ears in the crop. In 1928, when the disease attacked the Criewener 104 variety with unprecedented severity in central north Germany, the certified seed-grain of 1927 produced an equally high incidence of infected plants with the uncertified. On the

other hand, smutted crops of 1928 gave a completely healthy stand in 1929. The only absolute assurance against loose smut lies in the hot water treatment of the seed-grain.

Kann man flugbrandkranken Weizen aussäen? [Can Wheat infected by loose smut be sown?]—*Deutsche Landw. Presse*, lvii, 47, p. 642, 1930.

The writer of this note (representing the Association for the Promotion of German Plant Breeding) explains that the general objection to treating wheat seed-grain against loose smut [*Ustilago tritici*] by the hot water method, as required by Meyer-Bahlburg [see preceding abstract], is based on the difficulty of drying the grain back to its original water content. Moreover, the germination of the seed-grain is impaired unless it is sown very shortly after treatment. Hence this method of disinfection is only practicable if actually carried out on or near the farm where the seed is to be sown.

FELLOWS (H.). **Wheat take-all symptoms compared with injuries caused by chinch bugs.**—*Phytopath.*, xx, 11, pp. 907–909, 2 figs., 1930.

Comparative notes are given on the injury caused to wheat in Kansas by take-all (*Ophiobolus graminis*) [*R.A.M.*, ix, p. 708] and chinch bugs (*Blissus leucopterus*). The general reaction of the plants to both forms of injury is similar, being expressed by wilting, browning, and the final death of the leaves. The chinch bug, however, feeds chiefly on the phloem in the leaf sheaths, whereas *O. graminis* invades both the phloem and conjunctive tissue [ibid., viii, p. 369], and penetrates the primary and secondary roots, subcoronal internode, crown, leaf sheath, and culm tissues.

Both take-all and chinch bug injuries often occur in spots in the field, the former frequently being observed in the interior portion of fields with very heavy stands. The margin of the take-all spots is very distinct, while in the case of the insect the transition from diseased to healthy plants is more gradual. Wheat plants attacked by *B. leucopterus* show no damage to the root system, and only in advanced stages of infestation does a brownish tinge appear at the base of the culms. On the other hand, the take-all fungus hinders root formation, and imparts a black discoloration and brittle texture to those already formed. The culm bases become black and shining, and often exhibit a mycelial plate. Moreover, tillering is substantially reduced by the attacks of *O. graminis* but not by those of the chinch bug.

MAINS (E. B.). **Host specialization of Barley leaf rust, Puccinia anomala.**—*Phytopath.*, xx, 11, pp. 873–882, 3 figs., 1930.

Continuing his studies on barley leaf rust (*Puccinia anomala*) in Indiana [*R.A.M.*, iv, p. 160], the writer found that, in addition to barley, only a few closely related species of *Hordeum*, viz., *H. deficiens*, *H. distichon*, *H. intermedium*, and *H. spontaneum*, are favourable hosts for the fungus. A number of seedling Gramineae [which are listed], including species of *Agropyron*, *Alopecurus*, *Bromus*, *Elymus*, *Festuca*, *Poa*, rye, and wheat, showed practically

no trace of infection beyond occasional slight flecking in inoculation experiments.

Two physiological forms of *P. anomala* have been distinguished in the United States, as indicated by the differences in reaction of a select set of barley varieties, viz., Featherston C.I. 1120, Oderbrucker C.I. 940 and 957, unnamed C.I. 1347, Malting C.I. 1129, Manchuria C.I. 2330, Hooded Spring C.I. 716, and Horsford C.I. 507 and 877, which are highly resistant to physiological form 1 and more or less susceptible to form 2. Seven varieties, namely, Callas C.I. 2440, Mecknos Moroc C.I. 1379, Peruvian C.I. 935, Quinn C.I. 1024, Bolivia C.I. 1257, Juliaca C.I. 1114, and unnamed C.I. 2329, showed more or less resistance to both physiological forms. Of 26 varieties [which are enumerated], found by Waterhouse to be resistant to *P. anomala* in Australia [ibid., ix, p. 438], 22 were more susceptible to the American forms of the rust, indicating the existence of a third physiological form in Australia. The four remaining varieties, viz., Orge Fourrager (= the Australian B 102), No. 22 (= B 69), Orge 4th (= B 100), and Orge 14J (= B 101), were also resistant to the physiological forms used in these studies.

ISENBECK (K.). **Untersuchungen über Helminthosporium gramineum Rabh. im Rahmen der Immunitätszüchtung.** [Investigations on *Helminthosporium gramineum* Rabh. from the standpoint of breeding for immunity.]—*Phytopath. Zeitschr.*, ii, 5, pp. 503–555, 1930.

A full description is given of the writer's experiments at the Halle Agricultural Institute to determine the value of Genau's methods for the artificial inoculation of barley with *Helminthosporium gramineum* [*R.A.M.*, viii, p. 231]. The inoculation of the seed-grain both with mycelium and conidial suspensions proved satisfactory. Seedling infection gave unreliable results and was therefore abandoned. The inoculation of the flowers with dry conidial dust proved more successful and gave more uniform results than Genau's method of infection under humid conditions. Conidia of *H. gramineum* kept at −5° to 0° for 34 months germinated to the extent of 20 per cent.

The results of unpublished varietal tests with winter barleys carried out by Nicolaisen in 1926 showed that, in general, early varieties of the Eckendorfer type are the most susceptible, Kalkreuther Universal being an exception to this rule. Late varieties, e.g., Friedrichswerther Berg and Streng's Winter are highly resistant, while medium-late ones, such as Werther's Ettersberg and Almerfelder Winter are intermediate. In the writer's tests with 42 winter varieties of barley the most resistant was Streng's Winter and the most susceptible Breustedt's Schladener. The results of tests with 106 summer varieties were in fair agreement with those obtained by Genau [loc. cit.], with a few exceptions. Infection in the *nutans*-A types ranged from 0 to 32·3 per cent. (dry inoculation) and from 0 to 43·2 per cent. (humid). The *nutans*-C types, represented by Moravia, proved highly resistant, as also did *erectum* (contrary to Genau's results), *zeocrithum*, two-rowed awnless, four-rowed Himalaya, and Asiatic awnless; Capucin was apparently immune. Among the *inaequale* awned types

infection ranged from 0 (P.S.G. Nordland and Nakano Vase) to 39·5 per cent. (Bearer Ottawa); a high degree of resistance was shown by several Cape × Coast strains and various Californian and Turkish barleys, while Cape × Coast 1508, Velvet, and Minsturdi 1556 were very susceptible. The inoculation of the seed-grain under greenhouse conditions gave results differing considerably from those obtained by the infection of the flowers in the field, Wurla, for instance, being resistant under the latter conditions but highly susceptible under the former. A study of the reaction to *H. gramineum* of the F_3 (and in one case of the F_4 generation) of eight crosses between various combinations of resistant and susceptible parents indicated the dominance of resistance, in which several factors appeared to be involved.

Comparative cultural studies of *H. gramineum* from different sources showed that there are at least three physiologic strains of the fungus, viz., one from various German localities, one from Stettin, and one from California and Cenad (Banat) [Hungary]. Inoculation (seed and flower) experiments with the different strains showed considerable variations in pathogenicity, that from America and Cenad being the least virulent.

ITO (S.). **On some new ascigerous stages of the species of Helminthosporium parasitic on cereals.**—*Proc. Imper. Acad.*, Tokyo, vi, 8, pp. 352–355, 1930.

Continuing his studies on the ascigerous stages of the species of *Helminthosporium* parasitic on cereals in Japan [*R.A.M.*, vii, p. 54; viii, p. 438], the writer, in conjunction with K. Kuribayashi, here describes four new forms, viz., *Ophiobolus setariae* n. sp. (*H. setariae* Saw.) [ibid., viii, p. 529]; *Pyrenophora graminea* n. sp. (*H. gramineum*) [but see *P. graminea* (Died.) Drechsler: Brooks, Plant diseases, p. 192, 1928]; *P. japonica* n. sp.; and *P. avenae* n. sp. (*H. avenae* Eidam) [ibid., p. 195; *R.A.M.*, iii, p. 66; ix, p. 771; and next abstract].

O. setariae is characterized by dark brownish, pseudoparenchymatous, flask-shaped perithecia, with ostiolar beaks, the globose or short-ellipsoidal bodies measuring 240 to 500 by 220 to 315 μ and the paraboloid or cylindrical beaks 60 to 125 by 50 to 110 μ. The fusiform, straight or slightly curved asci are rounded at the apex, shortly stipitate at the base, hyaline, thin-walled, and measure 130 to 150 by 22 to 32 μ, with 1 to 8 filiform, hyaline or pale olive, 5- to 9-septate ascospores, coiled in a close helix and measuring 200 to 315 by 6 to 7 μ. The fungus occurs on *Setaria italica* var. *germanica*, *S. glauca*, *S. viridis*, and *S. viridis* var. *purpurascens*.

The perithecia of *P. graminea* develop on the rotten straw or stubble of barley attacked by *H. gramineum* during the growing season. They are subepidermal at first, later erumpent, globose when young, subsequently flask-shaped or conical by the formation of a short paraboloid, cylindrical ostiolar beak; the wall is blackish-brown, thick, pseudoparenchymatous, with many long setae and conidiophores on the surface; the bodies are 350 to 380 μ in height, 450 to 800 μ in long diameter, and 350 to 700 μ in short diameter. The fasciculate, long-clavate, hyaline asci measure 225 to 425 by 32 to 50 μ and contain 1 to 8 (mostly 4 to 8) yellowish-brown,

ellipsoidal ascospores, with 3 (rarely 2) transverse septa, sometimes accompanied by 1 or 2 longitudinal septa in the median cells, markedly constricted at the septum, and measuring 45 to 75 by 20 to 32·5 μ.

The perithecia of *P. japonica* develop on barley similarly to those of *P. graminea*; they measure 300 to 600 μ in height, 400 to 700 μ in long diameter, 350 to 500 μ in short diameter, and are furnished with paraboloid or cylindrical ostiolar beaks. The hyaline, fasciculate, clavate, curved asci are rounded at the apex, shortly stipitate at the base, measure 225 to 350 or occasionally up to 400 by 35 to 45 μ, and contain 8 yellowish-brown, ellipsoidal ascospores with 3 transverse septa, sometimes accompanied by 1 or 2 longitudinal septa in the median cells, much constricted at the septum, and measuring 40 to 65 by 17·5 to 30 μ. The conidia of this fungus are sooty-brown, rounded at both ends, 2- to 9 (mostly 4- to 6)-septate, and measure 42 to 145 by 15 to 18 μ.

The perithecia of *P. avenae* develop on the half-rotten straw, grain, or stubble of oats and *Avena fatua*; they are subepidermal at first, then erumpent, semiglobose when young, later flask-shaped or conical with short paraboloid or cylindrical ostiolar beaks; the blackish-brown, pseudoparenchymatous wall bears many long conidiophores and setae on the surface; the bodies measure 300 to 600 μ in height, 450 to 800 μ in long diameter, and 350 to 700 μ in short diameter. The fasciculate, clavate or cylindrical, hyaline asci are often slightly curved, rounded at the apex, shortly stipitate at the base, measure 250 to 350 or occasionally up to 400 by 35 to 45 μ, and contain 2 to 8 (mostly 8) pale yellowish or yellowish-brown, ellipsoidal or oval ascospores, with 3 to 6 (mostly 5) transverse septa, sometimes accompanied by 1 to 4 longitudinal septa, markedly constricted at the septa, and measuring 50 to 75 by 17·5 to 30 μ.

An analytical key is given to *O. miyabeanus*, *O. heterostrophus* [ibid., v, p. 293], *O. setariae*, *O. sativus*, *P. graminea*, *P. japonica*, *P. teres* [ibid., iii, p. 66], and *P. avenae*.

Commenting on Nisikado's division of *Helminthosporium* into two subgenera, *Eu-* and *Cylindro-Helminthosporium* [ibid., viii, p. 529], the writer proposes to elevate the latter to distinct generic rank under the name of *Drechslera*, comprising the following species: *D. arundinis* (*H. arundinis*), *D. catenaria* (*H. catenarium*) [loc. cit.], *D. gigantea* (*H. giganteum*), *D. tritici-vulgaris* (*H. tritici-vulgaris*) [loc. cit.], and the conidial stages of *P. graminea*, *P. teres*, *P. japonica*, *P. avenae*, *P. bromi*, and *P. tritici-repentis* [loc. cit.].

RATHSCHLAG (H.). **Studien über Helminthosporium avenae.** [Studies on *Helminthosporium avenae*.]—*Phytopath. Zeitschr.*, ii, 5, pp. 469–492, 6 figs., 1930.

The severe damage inflicted on the German oat crop during 1929 by *Helminthosporium avenae* [*R.A.M.*, ix, pp. 103, 771] led to an investigation of the morphology, biology, and taxonomy of the fungus [the results of which are here reported in detail].

The conidia of *H. avenae* in pure culture are light brown when young, turning darker with age, rounded at both ends, furnished

with 1 to 10 septa (6 on an average of 100 conidia), and measure 20 to 210 by 14 to 24 μ (average 90 by 17 μ). Germination occurred in about 5 hours in a moist chamber on a drop of biomalt agar at 19° to 20° C. As in the case of *H. gramineum* and *H. teres* [ibid., ix, p. 448], hyaline, septate germ-tubes may be produced by any of the cells of the conidium, but as a rule they arise from the end cells. Under certain conditions the conidia are able to abstrict new conidia immediately, in which case the germ-tube is converted into a conidiophore, turning brown and forming a conidium at the apex, while the remaining cells of the same spore may emit hyaline germ-tubes. The optimum temperature for germination was found to lie between 18° and 24°, the minimum and maximum being 6° and 32°, respectively. Exposure to low temperatures (six days at $-11°$ and then eight days at $-14°$) was found to stimulate germination considerably, on re-transfer to the optimum range. A high degree of atmospheric humidity proved to be essential to the germination of the conidia of *H. avenae*, a minimum of 96 per cent. being necessary. The conidia were found to be ripe for germination immediately after detachment from the conidiophores and to retain their viability for at least nine months; with increasing age, however, a longer time was required to induce germination (16 hours or more for 8-week-old individuals, compared with 6 hours for those freshly abstricted).

The aerial mycelium of *H. avenae* in pure culture is hyaline at first, soon changing to greenish-black or occasionally pink, septate, and contains oil drops; the hyphae measure 5 to 9 μ in width. The submerged mycelium is almost always dark-coloured. The stroma-like interweaving of the mycelium leads to the formation of fan or club-shaped structures, while concentric rings may also be observed in plate cultures. The maximum, optimum, and minimum temperatures for mycelial growth were found to be 33°, 20° to 25°, and 2° to 3°, respectively. The submerged mycelium was found to be considerably more resistant to the action of high temperatures than the aerial growth, the latter being killed in 20 minutes at 56° while the former only succumbed after 35 minutes. The mycelium of *H. avenae*, like the conidia, was stimulated to intensive growth by exposure for a time to the action of low temperatures.

Conidia were produced in these experiments on five agar media, viz., biomalt, oatmeal, potato, cherry, and salep. The perfect stage of the fungus, hitherto unknown [see preceding abstract], developed on an oatmeal agar culture kept at $-11°$ for six days and then transferred to room temperature. The perithecia are subspherical, black, without setae or papilla, and measure 118 to 140 μ in diameter. The asci are sac-shaped, tapering to a stalk at the base, and measure 192 by 29 μ; the length of the paraphyses ranges from 160 to 180 μ. The asci contain eight oblong, amber-yellow to brown ascospores with 5 to 8 transverse and longitudinal septa; they measure on an average 33 μ in thickness. Inoculations of oat leaves with the ascospores resulted in the development of spots on which the conidia of *H. avenae* were formed. The name *Pleospora avenae* Schaffnit and Rathschlag is proposed for the perfect stage of this fungus.

A study of the infection process showed that the germ-tube

extends to two or three times the length of the conidium, forms an appressorium on the leaf epidermis, and perforates the cell wall; entrance may also be effected through the stomata. The mycelium spreads intracellularly through the leaf tissues. The ovary may also be attacked from the resting mycelium occurring between the glume and the seed coat, but infection of the embryo was not observed. As early as five days after the initiation of infection the conidiophores may emerge through the epidermis, often in fascicles, and abstrict conidia as described above. Whereas primary infection always proceeds from the seed, either through conidia adhering to the exterior or through the mycelium between the glume and seed coat, secondary infection is spread by rain or wind or by diseased material left over after the harvest. Soil inoculation tests gave positive results, but here infection was limited to the leaf sheaths and leaves, the haulms not being attacked as in the case of direct inoculation of the seed-grain.

Inoculation experiments on a number of commercial varieties of oats [which are enumerated] gave no indication of any significant differences in reaction, 90 to 100 per cent. infection being obtained in all cases. Six wild forms, viz., *Avena byzantina*, *A. brevis*, *A. sterilis*, *A. strigosa*, *A. nuda*, and *A. fatua*, also proved susceptible to infection by *H. avenae*, though somewhat less so than the commercial varieties; *A. byzantina* was the most resistant (30 per cent. infection) and *A. brevis* the most susceptible (83 per cent.). The inoculation of barley and wheat plants with *H. avenae* gave 6·8 per cent. infection, while negative results were obtained with rye. It is considered unlikely that the other cereal crops play any significant part in the transmission of *H. avenae* to oats.

The fungus may be completely eliminated from the seed by 30 minutes' immersion in 0·5 or 0·25 per cent. uspulun or germisan or 15 minutes in 0·35 per cent. sublimoform. The application of 1 to 1·5 per cent. Bordeaux mixture to small centres of infection in the field also held the disease in check.

ESMARCH (F.). **Die Typhula-Fäule des Getreides.** [The *Typhula* rot of cereals.]—*Die Kranke Pflanze*, vii, 11–12, pp. 159–161, 1930.

Popular notes are given on the rot of barley and rye caused by *Typhula graminum* which is becoming increasingly prevalent in Germany [*R.A.M.*, ix, p. 644; x, p. 191]. The author's observations failed to reveal any connexion between the attacks of stem eelworms (*Tylenchus dipsaci*) and infection by *Typhula graminum*, which is apparently capable of parasitizing plants in a state of full vigour.

ALLEN (RUTH F.). **Heterothallism in Puccinia coronata.**—*Science*, N.S., lxxii, 1873, p. 536, 1930.

The sporidium of *Puccinia coronata* [*P. lolii*] on a *Rhamnus* leaf germinates by the formation of a short beak, pierces the outer wall, and enters the epidermal cell, in which the fungus grows into a four- to six-celled primary hypha. From each of the cells a branch forms that penetrates to the subepidermal region and there develops into haploid mycelium. The latter spreads between the

epidermis and the palisade parenchyma, forcing the two layers apart and forming a continuous stroma several cells in thickness, from which hyphae grow down between the palisade cells into the spongy mesophyll. Pycnidia are formed at fairly regular intervals on the subepidermal stroma. Later a similar but smaller stroma develops next to the lower epidermis and a few pycnidia appear on it, which open on to the lower leaf surface. In old infections the whole upper stroma with its pycnidia may peel off, leaving the palisade layer exposed.

P. lolii is partly, perhaps wholly, heterothallic. Seven out of eight infections occurring singly on eight *Rhamnus* plants produced no aecidiospores. On another plant bearing six infections the pycnidia were well mixed, and five out of the six produced open aecidia. The sterile infection produces aecidia which reach a considerable size but form no spores; at a certain stage of development, however, bi- or trinucleate cells develop in them. These cells grow irregularly and their nuclei increase in number, but sooner or later they deteriorate and die. Multinucleate cells are to be found in practically all the older sterile aecidia, and in a few cases they survive to a great age. One 62-day-old sterile infection contained immense cells of highly irregular form, each provided with 15 to 20 nuclei. In fertile infections the aecidia produce spores regularly; many of the cells are binucleate and some trinucleate, while in a few instances they are uninucleate or have four or five nuclei, but are never multinucleate.

The point at which the sporophyte is initiated in the fertile infection would seem to be variable. A few binucleate cells have been observed near a pycnidium in the subepidermal stroma, in hyphae between the palisade cells, in the mycelium of the spongy mesophyll, and above the aecidium. Occasionally a cell fusion can be seen between the hyphal cells at some distance from an aecidium, but they are mostly found at or near the upper edge of the aecidium, several cells above the sporogenous layer. In most cases several cell divisions take place between the initial binucleate cell of a series and the basal cell which will produce the spores. Basal cells and spores are usually binucleate, rarely tri- or quadrinucleate.

DIETZ (S. M.) & LEACH (L. D.). **Methods of eradicating Buckthorn (Rhamnus) susceptible to crown rust (Puccinia coronata) of Oats.**—*U.S. Dept. of Agric. Circ.* 133, 15 pp., 3 figs., 1 graph, 2 maps, 1930.

The authors state that investigations from 1923 to 1926, inclusive, have shown that out of the 19 species of *Rhamnus* which are known to be susceptible to crown rust of oats (*Puccinia coronata*) [*P. lolii*: *R.A.M.*, vi, p. 222], 12 occur in the United States, of which 3 only, namely, *R. alnifolia*, *R. cathartica*, and *R. lanceolata*, are to be found in the sections of the main oat-growing area in which uredospores of the rust do not overwinter. It was also proved that the two last-named species were responsible for starting the initial infection of oats in 11 years covering the period from 1916 to 1927. A partial survey showed the existence of 304,568 bushes of *R. cathartica* in the Upper Mississippi Valley,

and the number of bushes of *R. lanceolata* growing in the middle and lower portions of that valley has been estimated at 284,000. The other nine susceptible species are not yet known to occur in the oat belt, and a warning is given against their introduction there.

Some details are given of experiments in the eradication of the buckthorn bushes, which were mainly performed on *R. lanceolata*. Applications of common salt in doses varying from 5 lb. for the smaller bushes to 25 lb. for the larger ones, were sufficient to kill the bushes. The same result was also obtained by the application of kerosene in quantities from ½ to 5 quarts. Felling, followed by the application of 2½ lb. of salt to bushes up to 35 sq. in. in cross section at the crown, or 5 lb. for all larger bushes, was also effective. The lethal action of salt on *R. lanceolata* is most rapid during the spring, while kerosene acts most rapidly in midsummer.

SIMMONDS (P. M.). **Smut of wild Oats.**—*Scient. Agric.*, xi, 2, pp. 78–79, 1930.

Smut was not recorded on wild oats (*Avena fatua*) in Western Canada until 1928 when *Ustilago levis* [*U. kolleri*] was collected on this host in Saskatoon. A second collection was made in 1929. Greenhouse inoculation tests conducted by G. A. Scott at Saskatoon in 1926–7 showed that *U. kolleri* could be transferred from wild oats to Victory common oats, and vice versa. The wild oats easily became infected, the proportion of diseased heads in one test reaching 75 per cent. Field experiments by B. J. and W. G. Sallans in 1929 showed that both *U. kolleri* and *U. avenae* could infect wild oats, but the former gave the higher percentages of infection.

BIENKO (F.). **Ein Versuch über die Wirksamkeit von Trockenbeizmitteln gegen Haferflugbrand.** [An experiment on the efficacy of dusts against loose smut of Oats.]—*Deutsche Landw. Presse*, lvii, 46, p. 630, 1930.

Excellent results were again obtained in the control of loose smut of oats (*Ustilago avenae*) near Rostock by dusting the seed-grain with hafertillantin [*R.A.M.*, ix, p. 519]. The incidence of infection was reduced from 1,077 panicles in the plot sown with untreated, inoculated seed-grain to 0 and 1, respectively, in those with seed dusted at the rate of 150 to 200 gm. per cwt. The application of U.T. (a new preparation of the I. G. Farbenindustrie, not yet on the market) failed to give complete control (15 to 17 smutted panicles, respectively, in the tested plots). A characteristic feature of the plants in the plots from untreated, inoculated seed-grain was slow and irregular tillering [cf. ibid., vii, p. 503].

DURRELL (L. W.). **The pathology of Maize.**—*Bull. Torrey Bot. Club*, lvii, 4, pp. 233–237, 1930.

In this paper (read at the joint meeting of the Botanical Section of the American Association for the Advancement of Science, the American Phytopathological Society, and the American Society of Plant Physiologists at Des Moines, Iowa, on 31st December, 1929), the history of phytopathological researches on maize since their inception in Illinois in the 'eighties of last century is briefly traced

in semi-popular language. In connexion with a summary of investigations of maize diseases by the writer and others, it is mentioned that, under suitable environmental conditions, the maize stand may be reduced by 50 per cent. by infection with such common fungi as *Penicillium purpurogenum*. As a result of collective studies pursued at a number of experiment stations, it is estimated that fungous diseases are often responsible for a loss of 20 per cent. of the crop. Promising results in control have been obtained by seed treatment with mercuric dusts [*R.A.M.*, ix, p. 521].

EDDINS (A. H.). **Corn diseases in Florida.**—*Florida Agric. Exper. Stat. Bull.* 210, 35 pp., 25 figs., 1930.

Popular notes are given on the symptoms and control of a number of maize diseases in Florida, the most important being *Fusarium* and *Gibberella* dry rot [*G. saubinetii* and *G. moniliformis*]; *Diplodia* dry rot (*D. zeae* and *D. macrospora*) [*R.A.M.*, ix, pp. 712, 773]; brown spot (*Physoderma zeae-maydis*); smut (*Ustilago zeae*); scutellum rot (*Rhizopus*, *Aspergillus*, *Penicillium*, *Mucor*, and *Fusarium* spp.), the cause of much poor seed maize; leaf blight (*Helminthosporium turcicum*) [ibid., ix, p. 627]; *Ophiobolus* leaf spot (*O. heterostrophus*) [see above, p. 233], stated to have been reported only from Florida; and bacterial wilt (*Aplanobacter stewarti*) [ibid., x, p. 180] apparently affecting only the sweet varieties. Other organisms mentioned as occurring on maize in Florida include *Aspergillus flavus* and *A.* sp., causing yellow and green ear moulds, respectively, *Puccinia sorghi* [*P. maydis*: ibid., viii, p. 293], *Sclerotium rolfsii*, and *Pseudomonas* [*Bacterium*] *holci* [ibid., ix, p. 774; x, p. 180].

LEONIAN (L. H.). **Attempts to induce 'mixochimaera' in Fusarium moniliforme.**—*Phytopath.*, xx, 11, pp. 895–901, 2 figs., 1930.

This is an expanded account of the writer's investigations on the occurrence of dissociations and associations in certain strains of *Fusarium moniliforme* [*Gibberella moniliformis*] isolated from maize, a preliminary notice of which has already appeared [*R.A.M.*, ix, p. 374]. The results of these experiments, which involved the examination of hundreds of cultures, are considered to disprove the existence of 'mixochimaera' in the sense used by Brierley in his discussion of variation in fungi and bacteria [ibid., ix, p. 493]. The dissociants are regarded merely as normal variations from the type, their apparent abnormality or peculiarity being due to an incomplete understanding of the inherent possibilities of the species.

PORTER (R. H.), CHEN (H. K.), & YU (T. F.). **Smut resistance in Millet.**—*Phytopath.*, xx, 11, pp. 915–916, 1930.

The results [which are briefly summarized and tabulated] of four years' experiments at Nanking, China, on the reaction of millet [*Setaria italica*] to kernel smut (*Ustilago crameri*) [*R.A.M.*, viii, p. 454] showed that 20 out of the 30 selections tested are highly resistant to the disease. Two showed no smut in any of the trials and ten others only a trace in one or two years out of the four.

COLEMAN (L. C.). **Report of work on the Coffee Experiment Station, Balehonnur for the years 1925–30.**—*Mysore Coffee Exper. Stat. Bull.* 3, 23 pp., 6 pl., 3 plans, 1930.

An account is given of the objects, administration, and other features of interest of the Balehonnur Coffee Experiment Station, Mysore, India, which was established under the joint auspices of the Government and the United Planters' Association of South India in December, 1925. On pp. 7–10 a summary is given of the mycological investigations in progress at the Station (since 1928 under the supervision of W. W. Mayne). These include the importation and testing of new spraying apparatus; spraying trials; and investigations into leaf disease [*Hemileia vastatrix*: see next abstract], black rot [*Corticium koleroga*: *R.A.M.*, viii, p. 705], die-back, and root diseases. It was found that alum Bordeaux is equally effective with the ordinary mixture in the control of black rot and leaf disease, while the various dusts tested were decidedly inferior.

In connexion with a study of the causes underlying outbreaks of black rot, some old infected leaves were attached to healthy foliage on coffee plants during the monsoon, with the result that the disease spread from the infected to the healthy leaves. The fungus, therefore, is evidently able to survive the dry season on the old diseased leaves.

MAYNE (W. W.). **Seasonal periodicity of Coffee leaf disease (Hemileia vastatrix, B. & Br.).**—*Mysore Coffee Exper. Stat. Bull.* 4, 16 pp., 4 graphs, 1930.

Under the climatic conditions of North Mysore [which are described], the incidence of coffee leaf disease (*Hemileia vastatrix*) [*R.A.M.*, ix, p. 451] begins to increase after the blossom showers, and continues to do so slowly throughout the remainder of the hot weather and the south-west monsoon. The heavy and almost continual rainfall of the latter appears to check the development of the disease. With the onset of the intermittent rains of the north-east monsoon about the middle of September, the attack increases rapidly until a maximum is reached about the beginning of November. After this time the dry period sets in and leaf fall is so heavy that any further spread of the disease is masked, though there are indications that conditions are still favourable. With the continuance of the dry weather (which lasts till about the beginning of April) the disease ceases to spread and leaf fall decreases until a minimum is reached about the time of the blossom showers.

The increase of the disease is regular, i.e., the number of pustules at a given date determines the number at a later one, indicating the absence of any considerable external source of infection. The fungus develops from the pustules left on the trees from the previous attack.

The results of these investigations indicate that the period between the blossom showers and the beginning of the south-west monsoon is likely to be the most profitable time for spraying. A post-monsoon spray would probably be useful in checking the later

spread of the disease, but it may also keep on the trees leaves bearing one or two pustules capable of producing viable spores and thereby increase the potential sources of infection.

STEYAERT (R. L.). **Cladosporium hemileiae n. sp. Un parasite de l'Hemileia vastatrix Berk. et Br.** [*Cladosporium hemileiae* n. sp. A parasite of *Hemileia vastatrix* Berk. et Br.]—*Bull. Soc. Roy. Bot. de Belg.*, lxiii (2nd Ser., xiii), 1, pp. 46–47, 2 pl. (1 col.), 1930.

In lesions caused by *Hemileia vastatrix* on *Coffea robusta* growing at Biaro, Belgian Congo, the author observed the presence of a blackish, powdery hyperparasite. The light brown mycelium of the latter could be seen ramifying amongst, and sometimes penetrating, the uredospores of the rust. The dark brown, rigid, seldom articulated, 10 to 17-septate conidiophores were arranged in perpendicular bundles supported on pseudopodia and measured 150 to 330 μ in length. The conidia were terminal, light brown, elliptical, 1- to 3-septate, 1-guttulate, and 12·5 to 17·5 by 5 to 7·5 μ [5·7 μ in the diagnosis] in diameter. The fungus is named *Cladosporium hemileiae* n. sp., and a diagnosis is given in French.

ULTÉE (A. J.). **Bestrijding van topsterfte en van takinsterving.** [Control of top die-back and dying-off of branches.]—*De Bergcultures*, iv, 48, p. 1297, 1930.

Experiments by Dr. Muller are stated to have shown that the top die-back of coffee in Sumatra [*R.A.M.*, ix, p. 778] can be controlled by the systematic pruning of young diseased trees down to the first pair of healthy branches. The disease in older trees may be checked by cutting off affected branches at their juncture with the trunk, or with the main branch from which they spring. All the infected material should be burnt. The pruning operations should be performed at an appropriate time during the west monsoon.

[This paper is also published as *Proefstat. Malang Korte Meded.* 29, 1930.]

WALKER (M. N.). **Cotton diseases in Florida.**—*Florida Agric. Exper. Stat. Bull.* 214, 32 pp., 15 figs., 1930.

Popular notes are given on the symptoms and control of a number of diseases attacking cotton in Florida, where the annual loss from this source is estimated at from 15 to 25 per cent. of the crop. The most important of these diseases are wilt or black root (*Fusarium vasinfectum*) [see next abstract]; bacterial blight or angular leaf spot (*Pseudomonas* [*Bacterium*] *malvacearum*); 'rust' (also known as black rust, yellow leaf blight, and potash hunger), due to nutritional disturbances [see next abstract]; sore shin (*Corticium vagum solani* [*C. solani*: *R.A.M.*, ix, p. 178]; *Diplodia* boll rot (*D. gossypina*) [ibid., v, p. 90], the loss from which in Florida during the wet season of 1928 was estimated at 20 per cent. of the crop; and anthracnose (*Glomerella gossypii*) [ibid., v, p. 737 *et passim*] which formerly caused losses of 90 per cent. of the crop in Florida but during the last three years has been practically absent from the State.

Walker (M. N.). **Potash in relation to Cotton wilt.**—*Florida Agric. Exper. Stat. Bull.* 213, 10 pp., 1930.

The results [which are tabulated and discussed] of three tests on the effect of potash on the incidence of cotton wilt (*Fusarium vasinfectum*) on the susceptible Trice variety in Florida give no indication that this material is of direct value in the reduction of infection [*R.A.M.*, vii, p. 320]. Its use, however, to the extent of 3 to 5 per cent. in a complete fertilizer, is recommended as an aid to the reduction of 'rust' [see preceding abstract].

Ezekiel (W. N.) & Neal (D. C.). **Report of the Cotton root rot conference at Temple, Texas.**—*Phytopath.*, xx, 11, pp. 889–894, 1930.

The following points of interest in connexion with the study of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, x, p. 186] were mentioned at the third annual conference of workers on this problem, held at Temple, Texas, on 15th January, 1930. Most of the observations on the morphology, physiology, soil relations, and control of the fungus have already been noticed in this *Review*.

S. E. Wolff (Texas Agricultural Experiment Station) reported that *Allionia lanceolata* and *Psoralea tenuiflora* were highly susceptible to infection by the root rot fungus. One plant of *Salvia greggii* succumbed to the disease. Taubenhaus summarized the results of tests at the Station in which pomegranate, live oak [*Quercus virginiana*], and one species of hackberry [*Celtis*] were found to be resistant, while yaupon and another species of hackberry were susceptible. W. J. Bach, also of the Texas Station, reported the following new hosts from Weslaco: anise [*Pimpinella anisum*], endive [*Cichorium endivia*], escarole [chicory: *C. intybus*], *Jacaranda mimosaefolia*, *Schinus terebinthifolius*, and *Zelkova sinica*. The Turk's cap hibiscus (*Malvaviscus conzattii* or *arboreus*) proved resistant to root rot in spite of repeated inoculation; all the other members of the Malvaceae tested have been susceptible to the fungus.

All but 41 of the 11,000 varieties and strains of cotton tested at Blackland Substation (Texas) for resistance to root rot during the past three years have been eliminated as being susceptible.

Bach's three-year trials of 104 grape varieties and 12 rootstocks indicate that the Champenel, Mustang, and Black Spanish varieties are resistant to *Phymatotrichum* root rot, while *Vitis champini* is a promising rootstock. Of the citrus varieties tested, the sour orange [*Citrus aurantium*] appears highly resistant, while Cleopatra orange, *C. trifoliata*, the Rusk citrange [*C. sinensis* × *Poncirus trifoliata*], the Thomasville citrangequat [Willits citrange × *Fortunella margarita*], and Ichan lemon are very susceptible.

Grimes (M.), Kennelly (Violet C. E.), & Cummins (H. A.). **A study of fungi found in butter.**—*Scient. Proc. Roy. Dublin Soc.*, N.S., xix, 40–47, pp. 549–569, 2 pl., 1930.

Brief morphological and cultural descriptions are given of 29 species of moulds which were found in 1929 in samples of butter

examined at the Butter-Testing Station, Cork, Ireland, namely, *Aspergillus fumigatus*, *A. luteo-niger*, *A. sydowi*, *A. terreus*, *A. glaucus*, *Penicillium brevi-compactum*, *P. johannioli*, *P. cyclopium* var., *P. sartoryi* var., *P. spinulosum* var., *Gliocladium* spp., *Trichoderma lignorum*, *Graphium penicillioides*, *Coniosporium arundinis*, *Fusarium* spp. (including *F. reticulatum*), *Alternaria* spp., *Stemphylium* spp., *Torula* spp., *Phoma* spp., *Oospora lactis*, *Acrostalagmus cinnabarinus*, *Botrytis cinerea*, *Cladosporium* spp., *Mucor racemosus*, *M. corymbifer*, *Stysanus microsporus*, *Sporotrichum carnis*, *Trichothecium roseum*, and *Chaetomium bostrychoides*. The most prevalent species found are stated to have been, in order of frequence, *Penicillium* spp., *Oospora lactis*, and species of *Aspergillus*, *Cladosporium*, and *Phoma*. Practically all the fungi grew in Czapek's solution containing 10 per cent. sodium chloride, most were inhibited by 15 per cent., and all by 20 per cent. The moulds are aerobic, and usually show their presence by discoloured patches on the surface of the butter. No mould could survive the pasteurization temperature, 85° to 95° C., and it is thought that they enter the cream after pasteurization, during churning, or into the butter after manufacture, originating possibly from the water used, the churn, or from the air.

KENNELLY (VIOLET C. E.) & GRIMES (M.). **Paecilomyces hibernicum—new species.**—*Scient. Proc. Roy. Dublin Soc.*, N.S., xix, 40-47, pp. 513–516, 2 pl., 1930.

A morphological and cultural description is given of a mould isolated from butter in Ireland, which the authors consider to be a new species of *Paecilomyces* [*R.A.M.*, ix, p. 410], and which is named *P. hibernicum*. The conidia are elliptical, 4 by 2·6 μ in diameter, at first hyaline and later pink; they are formed so profusely that the culture is encrusted with them. Later, *Isaria*-like coremia are developed. Macrospores appeared in potato cultures but not on synthetic media, on which, however, swollen 'specialized' cells producing sterigmata were found. The fungus is killed by heating to 70° C., it partially liquefies gelatine with the production of acid and gas, and does not grow in Czapek's solution containing 15 per cent. sodium chloride. It is stated that cultures were submitted to Dr. Thom, who confirmed the fungus as a new species.

LANGERON (M.) & MILOCHEVITCH (S.). **Morphologie des dermatophytes sur milieux naturels et milieux à base de polysaccharides. Essai de classification. (Deuxième mémoire).** [The morphology of dermatophytes on natural media and on media containing polysaccharides. Tentative classification. (Second memoir).]—*Ann. de Parasitol. Humaine et Comp.*, viii, 5, pp. 465–508, 10 pl., 12 figs., 1930.

This is a detailed account of the authors' investigation of 25 species of dermatophytes [a list of which is given] on 13 specified media, which was made in continuation of their study of these pathogens [*R.A.M.*, ix, p. 781]. A discussion of the results obtained in over 2,000 cultures leads them to suggest a revised classification of these organisms as follows. (1) All the species so far included

in Sabouraud's *Trichophyton ectothrix microides* group (= *Sabouraudites* p.p. Ota et Langeron) and characterized by the presence of large, arched, torulose, or pectinate hyphae (similar to those constituting the floccose wall of *Ctenomyces* perithecia), smooth terminal spirals, spindle-shaped chlamydospores, and lateral spores of the aleuria type, should be referred to Eidam's genus *Ctenomyces*. The species known as *T. asteroides*, *T. granulosum*, *T. interdigitale*, and *T. radiolatum* (the last named of which, however, was not personally studied by the authors) show such morphological similarities that they are considered to be one and the same species which, by right of priority, should be named *T. mentagrophytes* (Ch. Robin, 1853); in the new classification this name becomes *C. mentagrophytes*. *C. lacticolor* Sabouraud 1910 is regarded as a valid species.

(2) All the former species of *Microsporon*, and also the species of *Achorion* characterized by morphological features similar to those of *Microsporon* (terminal spirals, numerous yellowish, spindle-shaped chlamydospores, and a conidial apparatus less complicated than in *Ctenomyces*) should be referred to the genus *Sabouraudites sensu stricto*; the species of *Achorion* thus displaced are *A. gypseum*, *A. gallinae*, and *A. quinckeanum*, which become *S. gypseus*, *S. gallinae*, and *S. quinckeanus*. Other species listed are *S. felineus*, *S. audouini*, and *S. umbonatus*.

(3) The genus *Epidermophyton* is preserved in the sense attributed to it by Ota and Langeron. So far it only includes the former *E. cruris* which, by right of priority, should be *E. floccosum* (Harz, 1873) [cf. ibid., ix, p. 243], and with which *E. inguinale* and *E. clypeiforme* are regarded as synonymous. *E. rubrum* is certainly not congeneric, and doubt remains regarding *E. plurizoniforme*, *E. lanoroseum*, and *E. niveum*.

(4) All the other species studied by the authors are referred to the genus *Trichophyton*, the first section of which, the endothrix types, includes *T. cerebriforme* and *T. violaceum*; the second, with megaspores, *T. rosaceum*, *T. equinum*, and *T. album*; the third (corresponding to the old *Endodermophyton* and *Epidermophyton*), *T. concentricum*, *T. rubrum*, and the remaining species of *Epidermophyton* other than *E. floccosum*.

Two members of the dermatophytes, *A. schoenleini* and *M. ferrugineum*, remain outside the scope of this classification. It is considered that the genera *Epidermophyton*, *Bodinia*, and *Grubyella* should be dropped.

The paper terminates with technical descriptions of, and notes on, the genera thus established and the species included in them.

BEHDJET (H.). **Epidermophytie Castellani oder Epidermophyton purpureum Bang.** [Epidermophytosis Castellani or *Epidermophyton purpureum* Bang.]—*Dermatol. Wochenschr.*, xci, 44, pp. 1623–1624, 1930.

Epidermophyton [*Trichophyton*] *purpureum* [*R.A.M.*, ix, p. 525] was isolated from four cases of generalized dermatomycosis in young men in Constantinople, where 'piedra' [*Piedraia hortai*: ibid., x, p. 27] has also been observed in four instances.

BAUDET (E. A. R. F.). **Sur un cas de teigne humaine produite par un dermatophyte mégaspore.** [On a case of human ringworm caused by a megasporous dermatophyte.]—*Ann. de Parasitol. Humaine et Comp.*, viii, 5, pp. 512–519, 1 pl., 6 figs., 1930.

A brief morphological account is given of a fungus which was isolated from a case of human ringworm in Paris. One-month-old cultures of the organism showed the microscopical characters of a faviform species of *Trichophyton*, but cultures two or three months old developed not only lateral aleuria but also pectinate hyphae bearing rudimentary and normal aleuria, with all transitional forms between these two types. In the older cultures the chlamydospores were exceptionally large (20 to 30 μ in diameter), and were borne on hyphae from 2·5 to 4·5 μ thick, occasionally with clavate tips up to 5 μ in diameter. Macroscopically the fungus resembled *Trichophyton album*, but differed from it in certain microscopical details. Inoculations on the guinea-pig gave negative results.

BURGESS (R.). **The liability of dyed wool to mildew with special reference to the resistance resulting from chroming.**—*Journ. Textile Inst.*, xxi, 9, pp. T441–T452, 1930.

The results of numerous tests [which are tabulated and discussed] indicated that the chrome-dyeing of woollen textiles imparts considerable resistance to the growth of the mould fungi responsible for mildew (chiefly *Aspergillus niger*, *A. fumigatus*, *Cephalothecium* [*Trichothecium*] *roseum*, and *Penicillium brevicaule*) [*R.A.M.*, viii, p. 38; ix, pp. 315, 784].

Of 131 samples of worsted cloth dyed by various methods and inoculated with [unspecified] mould spores, 49, of which 46 had been chrome-dyed, showed marked resistance to mildew. When scoured flannel was similarly treated, 0·5 per cent. chrome, as CrO_3 or Cr_2O_3 imparted definite resistance to mould growth, while 1 per cent. chrome checked it. Cloth dyed with numerous [named] substances, variously treated, and inoculated with *P. brevicaule* and *A. niger*, showed on the chromed samples only very slight development of mildew, as compared with unchromed material; the former resisted mildew in spite of the presence of small amounts of alkali or acid. Pieces of cloth were also treated with twelve dyes, six of which were chromes, and heavily inoculated with *Bacillus mesentericus ruber* and mould spores; no evidence of bacterial development was obtained, and while mould appeared abundantly on all the unchromed cloth, the chromed samples were only slightly affected.

Evidence was obtained that chrome-dyeing removes potential food material from the wool, and exercises an inhibitory effect on the growth of the fungi by producing an impoverishment of the wool as a source of the required nutrient.

BAUDYŠ (E.). **Braunwerden der Pelargonienblätter und -Blüten.** [Browning of *Pelargonium* leaves and flowers.]—*Blumen- und Pflanzenbau*, xlv, 11, pp. 176–178, 2 figs., 1930.

Greenhouse plants of *Pelargonium* at Brünn [Czecho-Slovakia]

are stated to be very liable to infection by *Botrytis cinerea* [*R.A.M.*, v, pp. 611, 701], which produces a brown discoloration and premature death of the flowers, subsequently spreading to the leaves, where it causes irregular brown spots and curling. In some cases the foliage is attacked before the flowers. In close and ill-ventilated houses infection may spread to the stems. Good control of this disease has been given by spraying with 1 per cent. solbar at fortnightly intervals; the plants were found to tolerate a concentration of 1·5 per cent. without adverse effects.

FERRARIS (T.). **Il seccume fogliare o 'septoriosi' del Crisantemo.** [Leaf withering or 'septoriosis' of Chrysanthemum.]—*Rivista Agricola*, xxvi, 599, p. 526, 1930.

To obtain good control of the leaf spot of chrysanthemums caused by *Septoria chrysanthemi* [*R.A.M.*, vi, pp. 164, 298] the author recommends that applications of 0·5 per cent. Bordeaux mixture and 1·5 per cent. Caffaro powder should be made to the leaves early in August, followed by a further application towards the end of the month, 1·5 per cent. Bordeaux mixture being used if rain prevails. Two further treatments should be made at the latter strength during October when, if the attack is severe, ammonium chloride should be added to the spray at the rate of 150 gm. per hl. In all, five or six applications should be made, except in dry seasons, when four suffice.

All infected material should be burnt, and the soil given phosphatic rather than organic manurial dressings (the latter should at no time be excessive) in spring.

BONGINI (VIRGINIA). **Cancro pedale dei Garofani (Fusarium dianthi Prill. Delacr.).** [Basal rot of Carnations (*Fusarium dianthi* Prill. & Delacr.).]—*La Difesa delle Piante*, vii, 4, pp. 6–8, 1930.

In May, 1930, carnations growing in the vicinity of Turin were widely attacked by a basal rot caused by *Fusarium dianthi* [*R.A.M.*, iii, p. 652; iv, p. 18]. The tissues of the affected plants lost their turgidity, the leaves gradually wilted, the lower leaves withered, the shoots, beginning with the lowest, outermost ones, died, and finally the whole plant succumbed. A cankered zone extended for 3 to 4 cm. between the collar and the lowest lateral shoots, the stem being easily detachable from the root. Infection generally started at the point of insertion of the secondary shoots and descended towards the collar without, however, affecting the roots. The attacks were at first sporadic, but during a warm, wet period which ensued, the disease spread from plant to plant.

The first infections by *F. dianthi*, it is considered, are due to insect punctures or injuries sustained during cultural operations, but later the mycelium becomes more virulent and parasitizes neighbouring uninjured plants. The spread of the fungus is favoured by gathering flowers from diseased and healthy plants in the same operation, and by the watering of the soil, in which the fungus lives saprophytically.

Dead plants should be at once destroyed and the soil round affected ones and those in close vicinity to them dusted with copper oxychloride applied at the rate of about 30 gm. per plant.

FISCHER (R.). **Fusskrankheit der Sommerastern.** [Foot rot of summer Asters.]—*Gartenwelt*, xxxiv, 46, pp. 636–637, 1 fig., 1930.

Popular notes are given on the occurrence of foot rot of summer asters [*Callistephus chinensis*] caused by *Fusarium* sp. in Vienna [*R.A.M.*, v, p. 492; ix, p. 700]. The disease is found chiefly on plants growing in damp or irregularly watered soils. Infection is stated to occur through the soil and to be promoted by the copious use of nitrogenous manures. Some indications are given for the control of the disease by cultural measures, and by the local application of sulphur to the soil round the plants remaining after the removal of infected individuals.

RAMAKRISHNAN (T. S.). **A wilt of Zinnia caused by Sclerotium rolfsii.**—Reprinted from *Madras Agric. Journ.*, 9 pp., October, 1930.

Sclerotium rolfsii was observed to cause a wilting of *Zinnia* [*elegans*] plants in Madras. The fungus was isolated from diseased plants and inoculated into healthy ones with positive results. This is stated to be the first record of *S. rolfsii* on *Zinnia.* Other plants artificially infected at the same time were groundnut, cowpea, lucerne, Bengal gram [*Cicer arietinum*], linseed seedlings, *Cosmos,* maize and potato seedlings, and Cambodia cotton. Pot experiments with *Zinnia* seedlings showed that the disease may be contracted from infected soil.

The fungus made profuse growth on artificial substrata, slightly increasing the acidity of the medium. The sclerotia were found to retain their viability for 13 months under normal conditions, but were killed by one hour's exposure to dry heat at 55° C., by immersion in 0·5 per cent. germisan or uspulun or 0·2 per cent. mercuric chloride for the same period, and by $1\frac{1}{2}$ hours in 2 per cent. formalin [cf. ibid., vi, p. 439].

TOCHINAI (Y.) & SHIMADA (S.). **Sporotrichum narcissi sp. n. parasitic on Narcissus bulbs.**—*Trans. Sapporo Nat. Hist. Soc.*, xi, 3, pp. 121–128, 1 fig., 1930. [Japanese summary.]

Narcissus pseudo-narcissus plants in Tokyo were affected in the spring of 1930 by severe stunting and yellowing of the leaves, accompanied by more or less extensive rotting of the bulbs, which were found to be covered with small, cushion-shaped, dark green acervuli.

Two species of *Sporotrichum* were isolated from the diseased material, viz., *S. radicicolum* [*R.A.M.*, vii, p. 97], first reported by Zimmermann on cultivated tropical plants (*Centralbl. für Bakt.*, Ab. 2, viii, p. 216, 1902), but not hitherto known to occur in Japan, and an apparently new species of *Sporotrichum* to which the name *S. narcissi* is given. This organism is characterized by a white, later dark green mycelium with terminal or intercalary gemmae which are spherical to short ellipsoidal and measure 7·5 to 12 μ in diameter; hyaline, branched conidiophores, 2 to 4·5 μ wide, bearing laterally or terminally oblong, straight or curved, attenuated or acute sterigmata, 5 to 15 by 2 to 4 μ (generally 10 by 2·5 to 3 μ);

and subspherical, rarely slightly ovoid or ellipsoid, green conidia, borne directly on the tips of the conidiophores or on the sterigmata, measuring 3·3 to 5 by 3 to 4·5 μ. *S. narcissi* differs from *S. radicicolum* in the dark green colour of the conidia, which are pale cress-green or olive-buff in the latter organism, as well as in the much greater length and irregular formation of the sterigmata and larger dimensions of the conidia. *S. narcissi* was also found on *Lilium* bulbs and *Crocus* corms.

The infection of the *Narcissus* bulbs by *S. narcissi* is believed to have spread from the leaves of the plants, which were cut off after flowering in the preceding year and left over winter in the soil. Inoculation experiments with both species on wounded healthy bulbs gave positive results, *S. narcissi* being rather more virulent than *S. radicicolum*.

Notes are given on the cultural characters of the fungi, both of which grew well on various standard media at 15° to 28° C.

STOUT (A. B.). **Virus diseases of Lilies in England.**—*Gard. Chron.*, lxxxviii, 2296, pp. 532–533, 1930.

During August, 1930, the writer inspected the lilies in various nurseries and greenhouses for the presence of virus diseases. These were found to be very prevalent in *Lilium longiflorum*, *L. auratum*, *L. speciosum*, and *L. superbum*. In one locality *L. auratum* and *L. longiflorum giganteum* were observed to be severely diseased, 75 per cent. of the latter in two greenhouses being in the advanced stages of 'yellow flat' and mosaic [*R.A.M.*, viii, pp. 383, 577]. Mr. L. Ogilvie, who accompanied the writer, detected the aphid [*Aphis gossypii*] known to transmit the virus of yellow flat, and there was evidence that the disease was in process of transmission from infected to healthy plants.

KOTTHOFF (P.). **Beitrag zur Kenntnis der Gattung Pestalozzia de Not.** [Contribution to the knowledge of the genus *Pestalozzia* de Not.]—*Gartenbauwissensch.*, iii, pp. 71–73, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 8–14, p. 285, 1930.]

A species of *Pestalozzia* belonging to the *versicolor* group was isolated from *Azalea indica* [*Rhododendron indicum*] (M. Petrick variety) imported into Germany from Belgium [cf. *R.A.M.*, vi, p. 489]. Inoculation experiments on *R. indicum* in the greenhouse at 18° C. gave negative results, so that the fungus can only be a facultative parasite.

BAUDYŠ (E.). **Padlí na ovocných stromech a keřích.** [Mildews of fruit trees and shrubs.]—*Český Odbor Zemědělské Rady Moravské* [*Bohemian Branch of the Moravian Agricultural Council*], Brno, *Leaflet* 32, 2 pp., 1 fig. [Received December, 1930.]

In this leaflet brief, popular accounts are given of the mildews which attack the chief fruit crops in Bohemia, namely, *Podosphaera leucotricha* on the apple and pear; *P.* [*oxyacanthae* f.] *tridactyla* [ibid., v, p. 699], and *Uncinula prunastri* [ibid., i, p. 335] on the plum; *Sphaerotheca* [*pannosa* f.] *persicae* [ibid., vii, p. 123]

on the peach and apricot; *S. fragariae* [*S. humuli*] on the strawberry [ibid., vii, p. 491]; *S. mors-uvae* on the gooseberry and certain species of currants; and *Phyllactinia corylea* on the hazelnut. The control measures to be applied against these diseases are indicated.

TEHON (L. R.) & STOUT (G. L.). **Epidemic diseases of fruit trees in Illinois 1922–1928.**—*Illinois Dept. Registr. and Educ., Div. of Nat. Hist. Survey, Bull.* xviii, Art. 3, pp. 415–502, 1 fig., 8 diags., 22 graphs, 1930.

The methods used in the compilation of this comprehensive survey of the epidemic diseases of fruit trees in Illinois during the period 1922–28 are similar to those already described for cereal diseases in an earlier publication [*R.A.M.*, vii, p. 561]. The data taken on each season's manifestation of disease are concerned with two distinct phases, viz., (1) prevalence, expressed as the percentage of trees suffering from infection in diseased orchards, and (2) the intensity of attack, determined as (*a*) the percentage of infected fruits; (*b*) the amount of woody growth diseased or destroyed; and (*c*) the destructive effect on the leaves. The data are recorded by the observer in the orchard on special record sheets [specimens of which are given], and the season's sheets for each disease are alphabetically arranged by counties and numbered in sequence, the data thus furnished being assembled in a series of tabulations. In this connexion it is of interest to note that, according to the latest available figures, the total number of fruit trees in the State is just over 12,821,000, of which 6,764,000 are apples, 4,139,000 peaches, 767,000 pears, 754,000 cherries, and 395,000 plums and prunes; the distribution of the trees is represented by means of a diagram.

Epidemic diseases usually produce lesions on the fruit, young twigs, and leaves, one or more of these organs being attacked according to the nature of the disturbance. To measure fully the intensity of an epidemic, each phase of its attack must be taken into account and the measurements maintained as a separate indicator of the degree of the epidemic. Prevalence and intensity of attack were calculated for apple scab (*Endostigme inaequalis* (Cke) Sydow) [*Venturia inaequalis*], blotch (*Phyllosticta solitaria*), black rot (*Physalospora malorum*) [*P. cydoniae*], fireblight (*Bacillus amylovorus*), and rust (*Gymnosporangium juniperi-virginianae*); pear blight (*B. amylovorus*); peach brown rot (*Sclerotinia cinerea*) [*S. americana*], bacterial shot hole (*Pseudomonas* [*Bacterium*] *pruni*), leaf curl (*Exoascus* [*Taphrina*] *deformans*), and scab (*Cladosporium carpophilum*); and plum and cherry brown rot [*S. americana*] and leaf spot (*Coccomyces* spp.). The data so accumulated have been evaluated and reduced to averages, here termed indices. Thus apple blotch, for instance, is given the following indices for 1922: prevalence, 53·03 per cent.; intensity of fruit attack, 41·36; intensity of twig attack, 10·49; and intensity of leaf attack, 2·56. These indices, the exact significance of which is explained in the section entitled 'Analysis of data', present a complete evaluation of apple blotch, in all its epidemic aspects, for the summer of 1922.

No general law appears to govern the seasonal changes exhibited by fruit tree diseases. The fluctuations of individual diseases are often so great and inconsistent as to seem purely capricious. Moreover, no regular interdependence was observed between prevalence and intensity of attack. There is, however, one exception to these generalizations, namely, the year 1925, which proved uniformly unfavourable to all diseases. The conditions of that year were such that, apart from the twig phase of apple blotch, no fruit tree disease achieved significant proportions either of prevalence or intensity.

QUINN (G.). **Root gall in fruit trees.**—*Fruit World of Australasia*, xxxi, 11, p. 428, 1930.

Fruit trees in South Australia often show galls of unknown origin, generally beginning as a small, wart-like growth on the roots and rapidly enlarging and drying up into a large hardened mass connected with the host by a stalk of tissue usually not more than $\frac{3}{8}$ in. in diameter. The defect appears to be most prevalent on sandy soils in warm localities. Almonds, peaches, and plums are more liable to attack than are apricots; pears are highly susceptible, apples less so, and citrus trees are not seriously affected.

If the galls are attached to the collar where the stem and roots meet, the tree may be ruined, but if they are present only on the roots, a foot or more distant from the stem base, the trees may remain uninjured for years.

It is understood that Prof. T. G. B. Osborn isolated an organism from one of these galls, which he believed would prove identical with *Bacterium tumefaciens*, but circumstances prevented further work on it.

An attempt by the writer to transmit the condition to healthy apples, almonds, and loquats [*Eriobotrya japonica*] by slicing the bark and inserting underneath it the juice and thin slices of tissue from freshly cut galls from the roots of young apples gave negative results. In a further experiment, the soil where pears with huge galls had grown was mixed with the pulverized galls and planted with apparently healthy young pears; about four years later some of the roots bore small galls.

Directly galls appear on the stem above the collar they should be cut away, and the wound sterilized and painted over. Before replanting in a place where affected trees have been dug out the soil should be sterilized by burning on it the excavated roots and galls and other suitable trash.

COULSON (J. G.) & GODBOUT (F. L.). **Quebec spray service report for 1929.**—*Thirty-sixth Ann. Rept. Quebec Pomol. and Fruit Growing Soc. 1929*, pp. 84–106, 4 figs., 4 charts, 1930.

An account is given of the first year's work of a spray service against apple scab [*Venturia inaequalis*] inaugurated in Quebec in 1929, and through which approximately 114 growers received spray notices.

Early in the spring spore traps (consisting of oiled slides placed immediately over infected leaves on the ground) were set in twelve

different orchards, the slides being collected and replaced every 24 hours (except on Sundays) from 27th April to 13th June (by which date the winter spore discharge had become very slight), the slides subsequently being collected every 72 hours up to 2nd July, except in two orchards, where they were maintained rather longer.

The heaviest spore discharges in all parts except the southernmost lasted from the middle of May until the middle of June, or from the pre-pink up to a few days after the calyx stage. In the most southern area (Hemmingford) this period was a few days earlier, or from the green tip to the calyx stage. Ascospore discharges were not always associated with low temperatures, but were all directly correlated with rainy periods.

More scab was reported in the treated orchards than had been expected, owing to inefficient spraying; the omission of the final late spray recommended entailed severe infection in certain cases owing to the heavy rain shortly before picking [cf. *R.A.M.*, x, p. 36].

In the great majority of the orchards sprayed under the new service, scab infection was less than in the previous year, those growers reporting no change having in most cases previously practised regular and careful spraying. The first year's work of the spray service is regarded as very encouraging, and it is felt that it will amply justify the work involved.

MacDaniels (L. H.) & Heinicke (A. J.). **To what extent is 'spray burn' of Apple fruit caused by the freezing of the flowers?**—*Phytopath.*, xx, 11, pp. 903–906, 2 figs., 1930.

On 14th May, 1928, the temperature in the Cornell (New York) University orchard fell to 24° F., causing serious damage to the opening apple blossoms. During the following summer and autumn the fruit of nearly all varieties throughout New York State showed conspicuous russeting of the type usually attributed to 'spray burn', but probably due in this case to the exceptional cold in May. This supposition is strengthened by the fact that the injury occurred on untreated as well as sprayed apples, and also by the absence of any such damage in 1929, when the minimum temperature during the blossoming period was 29° (10th May).

Wormald (H.). **Further studies of the brown rot fungi. IV. Sclerotinia fructigena as the cause of an Apple canker.**—*Trans. Brit. Mycol. Soc.*, xv, 1–2, pp. 102–107, 1 pl., 1930.

In continuation of his investigation of the brown rot fungi [*R.A.M.*, viii, p. 253] the author describes a severe outbreak in 1928 of *Sclerotinia fructigena* on four Melon apple trees at the East Malling Research Station. An examination of the diseased trees, which exhibited a withering of the leaves on some of the leading shoots, showed that in each case the fungus had first infected the fruit, whence it had extended into the spur, and thence to the branch where it produced a canker, often girdling the branch and killing the parts above. *Monilia* pustules appeared on the

infected parts during the period of infection (August). On the infected branches that were cut off and exposed to open-air conditions, the pustules ceased to function on the approach of winter, but again reappeared in the following June. Similar infections of *S. fructigena* were also observed on James Grieve, Cutler Grieve, Cox's Orange Pippin, and on an undetermined variety at Kew, Surrey.

JØRGENSEN (C. A.). **Barkkræft paa Æble og Pære, foraarsaget af Neofabræa corticola (Edgert.) C.A.J. n. sp. et n. comb.** [Bark canker on Apples and Pears, caused by *Neofabraea corticola* (Edgert.) C.A.J. n. sp. et n. comb.]—*Tidsskr. for Planteavl*, xxxvi, 5, pp. 800–811, 13 figs., 1930.

The bark canker caused by *Myxosporium corticolum* [*R.A.M.*, viii, p. 150] which, with its perfect stage, *Neofabraea corticola* [see below, p. 272], was detected on apple branches in January, 1930, for the first time in Denmark, are usually oval to circular, seldom more than 6 to 8 cm. in diameter, on the trunk and thick branches, while on the more slender branches they may attain a length of 10 to 12 cm. in a month and extend half-way round the twig. Infection by the conidia probably occurs chiefly during the spring. In the autumn, when the activity of the fungus ceases, the line dividing the diseased from the healthy bark is generally marked by a crack. The infected bark turns reddish-grey or reddish-brown and becomes somewhat shrivelled; innumerable pustules soon appear, containing the ripening spores. The fungus may or may not spread during the year following infection, but in any case the injuries are of a purely superficial nature and appear to cause no serious harm. The most susceptible apple varieties in the Guldborg orchard, Lolland, are Pigeon, Cox's Pomona, Lord Suffield, Queen, and Gul Graasten, while Cox's Orange is immune.

After the first record of *M. corticolum*, further reports of the occurrence of the fungus both on apples and pears were received from various quarters. The writer thinks it has probably long been present in Denmark but has hitherto been overlooked. The present extensive outbreak is tentatively attributed to the excessive use of oils and carbolineum for winter treatments, thereby weakening the bark of the trees and rendering it susceptible to infection.

The morphological and cultural characters of the fungus are described and its taxonomy fully discussed [loc. cit].

THOMAS (H. E.). **Pear scab.**—*Monthly Bull. Dept. of Agric. California*, xix, 11, pp. 761–765, 1930.

To ascertain whether the perithecia of *Venturia pirina* [*R.A.M.*, ix, pp. 461, 790, 792] are commonly present in the coastal regions of California, where scab is the only economically important disease of pears, observations were made on the part played in primary infection by ascospores and conidia from twig lesions.

Searches made from June, 1929, and from March, 1930, showed that in orchards where scab was known to occur no twig infections

could be found or, if present, they had already ceased to be active. In 1929 most of the current season's lesions became circumscribed by a cork layer before the end of the growing season.

The long dry periods of the region in question appear to prevent the development of perithecia on the more exposed leaves, but on the deeply covered ones ascospores were found in abundance and were mature by 11th March in the following year, at which date most of the buds were in the delayed dormant stage.

Ascospores from leaves collected on 22nd and 27th March were used to inoculate pear foliage in the greenhouse and produced spots in 12 days.

That the conidia of *V. pirina* are disseminated by rain, not wind, was indicated by the fact that when pears bearing numerous conidia were submitted to a powerful blast only an occasional spore was caught on exposed vaselined slides, whereas when a drop of water was allowed to fall on a lesion and drop off immediately, a mass of spores was carried away.

Comparative germination tests with conidia in drops of water, in water containing crushed leaf tissue of pear and apple, and in water into which unbroken leaves were allowed to dip showed that the presence of the leaf tissue slightly favoured germination. There was also an average difference of 14 per cent. between the germination of submerged spores near the centre and near the margin of the drop.

When conidia were placed on the uninjured surface of detached pear leaves in Petri dishes and water added to the dish but not allowed to reach the leaves, although no film of water could be detected on the latter, the germination was more vigorous (in one case by 61 per cent.) than was obtained in water alone.

Records on individual shoots on 29th and 30th July indicated that early fogs and dews were insufficient to promote new infections, and that the foliage tended to become resistant rather quickly, only one or two leaves being attacked on most of the shoots, although 15 to 25 leaves were equally exposed; the fruit appeared to develop a similar, though possibly less marked, resistance.

It is concluded that ascospores are the principal cause of primary infection in California and that, therefore, more attention should be paid to spraying during the period of their discharge, especially when the tips of the flower buds are first exposed, and again when the buds separate in the cluster.

RIETSEMA (J.). **Weinig bekende ziekten in Kers, Pruim en Perzik.** [Little-known diseases in Cherry, Plum, and Peach.] —*Tijdschr. over Plantenziekten*, xxxvi, 11, pp. 261–266, 1 pl., 3 figs., 1930.

Notes are given on an obscure condition, known as vitrosis, affecting cherry, plum, and peach trees in Holland. The leaves present a glassy appearance, the lamina is abnormally narrow and sometimes crumpled, and the indentations of the margins are absent, as though melted away. In plums and cherries vitrosis is sometimes associated with a form of mosaic.

BAUDYŠ (E.). **Hnití ovoce ve skládkách.** [Fruit rots in storage.]—*Česky Odbor Zemědělské Rady Moravské* [*Bohemian Branch of the Moravian Agricultural Council*], Brno, *Leaflet* 26, 2 pp., 1 fig. [Received December, 1930.]

Brief notes are given on the more important rots of fruits kept under ordinary storage conditions in Bohemia. Among the more common rots are included those caused by *Penicillium crustaceum*, *Aspergillus glaucus*, *Botrytis cinerea*, *Mucor mucedo*, *M. piriformis*, *M. racemosus*, *Trichothecium roseum*, and *Gloeosporium fructigenum* [*Glomerella cingulata*], all occurring on apples and pears except the last-named, which is listed on apples only, while the first and third are found on quinces also. Occasionlly some damage is also done in storage by *Leptothyrium pomi*, *Torula* spp., *Cladosporium* spp., *Alternaria tenuis*, and *Fusarium putrefaciens* [*F. herbarum*: *R.A.M.*, iii, p. 202] on apples; *Phytophthora omnivora* and *Pythium* sp., on pears; and *F. willkommii* [*Nectria galligena*] on both hosts.

The physiological diseases bitter pit and core breakdown also occur on stored apples.

KLEIN (N.). **Fruit gets a continuous cellulose coat.**—*Cellulose*, New York, i, 8, pp. 207–209, 4 figs., 1930.

Details are given of the so-called 'cellacote' process for the application of viscose wrappers to all kinds of fruit to prevent decay in storage. The plant is situated at Brawley, California, and is equipped with an automatic endless chain-basket, thus obviating the necessity of touching the fruit by hand until the viscose wrapping is dried and fully finished. As the wet film dries, it gradually shrinks and exerts an inwardly compressive force tending to seal the pores in the skin of the fruit, thereby preventing both the loss of the natural moisture content and the entrance of bacteria. The deterioration of the fruit is further controlled by the actual immersion in the viscose solution, the components of which are sufficiently strong to destroy any organisms remaining on the surface after sizing. In order to meet the requirements of growers, who maintain that the fruit should be allowed to 'breathe' during transport, an adaptation of the process has been devised whereby compressed air is admitted at regular intervals into the viscose bath, forming pinhead holes over 5 to 20 per cent. of the total surface of the coating.

BROOKS (A. N.), WATSON (J. R.), & MOWRY (H.). **Strawberries in Florida: culture, diseases, and insects.**—*Florida Agric. Exper. Stat. Bull.* 404, pp. 481–523, 14 figs., 1929. [Received February, 1931.]

Popular notes are given on the following diseases affecting the strawberry crop in Florida. Anthracnose (*Colletotrichum* sp.) [*R.A.M.*, vii, p. 253] is characterized by the appearance on the runners of oval, light brown, sunken spots, $\frac{3}{4}$ to 4 in. long, later becoming shrivelled and turning dark brown to black; the acervuli of the fungus are scattered over the lesions, which eventually

girdle the runners and kill the young plants forming at the tips. This disease, which seems to be confined to Florida, is most destructive after the first part of August. Some degree of control has been obtained by spraying with 4–4–50 Bordeaux mixture at 10-day intervals.

Root rot, associated with *Fusarium* sp. [ibid., ix, p. 433], *Rhizoctonia* sp. [ibid., vi, p. 469], and *Pythium* sp. [ibid., ix, p. 395], may be recognized by the progressive desiccation of the leaflets from the edges inwards; a rotting away of the root tips, accompanied by a brown spotting of the larger roots; and (in extreme cases) the complete decay of the cortical tissues, leaving the central cylinder exposed. No control measures are known.

Leaf spot (*Mycosphaerella fragariae*), leaf scorch (*Diplocarpon earliana*) [ibid., vi, p. 737], and leaf blight (*Dendrophoma obscurans*) [ibid., ix, p. 159] are usually of minor importance in Florida, and the same is true of mildew (*Sphaerotheca humuli*).

Of the four rots affecting Florida strawberries during transit and marketing, viz., *Rhizopus nigricans, Botrytis cinerea, Pezizella lythri*, and *Rhizoctonia* sp. [ibid., v, p. 41; vi, p. 240], the first-named is the most important.

WARDLAW (C. W.). **Panama disease research. A discussion of the relation of results obtained to field conditions.**—*Trop. Agriculture*, vii, 10, pp. 278-281, 1930.

After summing up the conclusions reached by himself and McGuire concerning the situation as regards Panama disease (*Fusarium cubense*) of bananas in Central and South America and the West Indies [*R.A.M.*, viii, p. 797], and reviewing the data obtained in his further experiments made to determine the conditions under which the fungus becomes parasitic on the roots of Gros Michel [ibid., ix, p. 796], the author states that such infection is conditional, and that with better planting material, good soil, and adequate drainage the disease may be expected to become less important. The paper concludes with a discussion of the practical application of the results obtained to the conditions of banana production prevailing in Central America and Jamaica, respectively.

WARD (F. S.). **Investigations on Panama disease in Malaya.**—*Straits Settlements and Federated Malay States, Dept. of Agric. Scient. Ser. 1930*, No. 2, 26 pp., 4 pl, 1930.

Further investigation of the Panama disease (*Fusarium cubense*) of bananas in Malaya [*R.A.M.*, vii, p. 652; ix, p. 663] showed that there appear to be two definite forms—an acute and a chronic one—of the trouble in that peninsula. In the acute form, which occurs more commonly on poorly cultivated soils invaded by the lalang grass [*Imperata arundinacea*], the growth of the plants may be entirely arrested: the stools remain dwarfed and most of the suckers die before reaching the fruiting stage. The first external symptom, usually found in suckers just approaching maturity, is a bright yellow discoloration of the leaves from the margin inwards or the development on them of yellow spots; the leaves then dry up, generally but not invariably, in the order of

their age. In very acute cases, the central and outer leaves decay almost simultaneously. Eventually the whole pseudostem falls over and rots. In the chronic form, the symptoms appear earlier and develop more slowly than in the acute form; they consist chiefly in the stunted and somewhat spindly growth of the suckers; and this condition is frequently followed by longitudinal splitting of the outer leaf sheaths. Instead of being formed, as is normal, within a year from planting, the fruit bunches do not appear for about two years; they are considerably reduced in size and contain only a small number of fruits which usually turn black in a few days and fail to ripen. The internal symptoms [a brief description of which is given] of the disease are similar in both the acute and chronic forms, though more strongly marked in the former.

The causal organism appears to be especially favoured by damp weather. In Malaya the worst outbreaks have occurred during or soon after the rainy season, and usually in poorly drained areas. Dry and very warm weather seems to have a definite inhibitory effect on the growth of the fungus. Experiments were carried out with strains of *F. cubense* obtained from Johore, Titi, Perak (Tapah), and Sitiawan in Malaya, and from Trinidad and Manila. The results showed that the most vigorous growth was obtained in cultures grown at a temperature of 20° C.; at room temperature (about 28°) growth was less vigorous, but better than at 35°.

Extensive inoculations and cultural experiments [details of which are given] indicated the existence in Malaya of at least four different strains of *F. cubense* which were compared with the named cultures from Manila, and were found to agree fairly closely with the latter. The characters of the four strains are described; small differences were found in the size of spores, but these are not considered to be of taxonomic value. It is pointed out that a species of *Fusarium* morphologically similar to *F. cubense* was isolated both from cultivated and virgin soil, but tests showed that susceptible banana varieties planted in the latter were not readily attacked by the disease. This observation is considered to indicate that Panama disease would cease to be a serious economic factor if soil conditions could be maintained approximating to those that obtain on virgin land. The inoculation experiments also confirmed the immunity from the disease of the Canary or Governor variety of banana [cf. ibid., v, p. 374], since they failed to give infection on the closely related Pisang Serendah or Chinese banana (*Musa cavendishii*).

KELSALL (A.), HOCKEY (J. F.), & WALKER (G. P.). **Experiments with new spray mixtures.**—*Thirty-sixth Ann. Rept. Quebec Pomol. and Fruit Growing Soc., 1929*, pp. 26–37, 1930.

In this paper the results of six years' experimentation with new sprays based on sulphur compounds are described. Copper sulphate with lime-sulphur, occasionally used by growers, was found to cause russeting of apples, while the use of zinc sulphate with lime-sulphur was without any distinct advantages. Aluminium sulphate and lime-sulphur with calcium arsenate [*R.A.M.*, x, p. 197] was equally efficacious as lime-sulphur lead arsenate against scab

[*Venturia inaequalis*] though probably somewhat inferior to Bordeaux mixture; the best formula was found to be 3½ lb. aluminium sulphate, 1 gall. standard concentrated lime-sulphur, and ¾ lb. calcium arsenate (up to 1½ lb. in pre-blossom applications and not more than ½ lb. in the last) in 40 galls. water. Nicotine sulphate may also be added, but the omission of the arsenate considerably reduced the fungicidal value of the mixture. The hydrogen sulphide gas generated in mixing the spray is poisonous and the brass parts of the outfit are liable to become corroded during use. Lime-sulphur injury was eliminated by the addition of the aluminium sulphate, and the growth of the leaves was stimulated, but the spray occasionally accentuated the arsenical trouble known as 'yellow leaf'.

A mixture of 4 lb. iron sulphate, 1 gall. concentrated lime-sulphur, ¾ lb. calcium arsenate to 40 galls. water gave only fair control of scab in 1927 and 1928 but much superior results in 1929; in these circumstances the exact fungicidal value of the mixture is regarded as doubtful, but is probably of a high order. Without calcium arsenate this was also a very poor fungicide, but when large amounts of calcium arsenate were included the mixture showed an extraordinarily high fungicidal value; the authors recommend a proportion of 1 lb. calcium arsenate to 40 galls. water. The foliage of trees sprayed with this mixture was consistently very good, with no trace of injury, the trees remaining healthy and thrifty throughout the season, in marked contrast to some of the lime-sulphur plots. This spray is very adhesive and should not be used, under Quebec conditions, after the beginning of July.

Promising results were obtained from one test made with calcium monosulphide [ibid., ix, p. 792] with the addition of insecticides.

NIETHAMMER (ANNELIESE). **Die Dosis toxica und tolerata von Uspulun Universal für einzelne landwirtschaftliche Sämereien.** [The *dosis toxica* and *tolerata* of uspulun-universal for some agricultural seeds.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 11, pp. 517–520, 1930.

In order to ascertain the *dosis tolerata* and *dosis toxica* of uspulun-universal for certain agricultural seeds, the latter were immersed for one hour in solutions of this preparation ranging from 0·1 to 2 per cent. [*R.A.M.*, ix, p. 445]. The following values were obtained: Postelberger wheat, *dosis tolerata* 0·3, *dosis toxica* 0·4 per cent.; Petkus rye, 0·3 and 0·4; *Lupinus albus*, 0·6 and 0·7; peas, 0·6 and 0·7; Export Danish tomatoes, 0·01 and 0·05; red cabbage (*Brassica capitata*), 0·2 and 0·25; cucumber, 0·8 and 0·9; *Cannabis sativa*, 0·6 and 0·7; Lochow's Petkus flax, 0·25 and 0·3; onion, 1 and 1·5; and mustard (*Sinapis alba*), 0·3 and 0·4.

It will be seen that most of the seeds, having relatively impermeable coats, sustain no injury as a result of treatment with 0·25 per cent. of the fungicide. In the case of tomato, however, both the hairs and the testa absorb large quantities of the latter and consequently suffer severe damage. Red cabbage seeds also absorbed comparatively large amounts, and were injured by one hour's immersion at 0·25 per cent. but not by half-an-hour.

HENRICI (A. T.). **Molds, yeasts, and actinomycetes.**—vii + 296 pp., 97 figs., 2 diags., 1 map, New York, J. Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1930.

In this work (stated to have developed from the lectures given by the author to students of bacteriology at the University of Minnesota), an attempt is made to bridge the gulf existing between the brief and inadequate discussions of the fungi found in current text-books of bacteriology and the extensive monographs and technical articles dealing with particular groups. The main objects of the book are to prepare the bacteriological student for the use of more technical literature by supplying some general information on the fungi, especially those of interest in relation to human and animal diseases, in the spoilage of foodstuffs, and the like; to present such descriptions and keys as may facilitate the ready identification of the commoner and more important species, and the placing of the remainder approximately within their proper family and genus; and to furnish (at the end of each chapter) references to general works or specific monographs containing detailed information on particular forms. Most of the illustrations are original.

WILTSHIRE (S. P.). **A method for the preservation of Petri dish cultures of fungi.**—*Trans. Brit. Mycol. Soc.*, xv, 1–2, pp. 93–95, 1930.

A brief description is given of a method for preserving indefinitely cultures of fungi as herbarium material. In its essential features it consists in growing the fungus in a Petri dish, preferably on clear maize meal agar [the preparation of which is indicated]; as soon as the desired stage of development is attained, the agar is loosened from the sides of the dish by means of a scalpel; one side of the agar is then lifted, the fingers placed beneath, and the culture lifted out of the dish and laid flat on a piece of polished waxed cardboard (with a layer of wax $\frac{1}{4}$ in. in thickness on the surface), on which a large drop of water has been placed. After draining off the excess water, the cardboard with the culture is inverted and the latter is allowed to dry, when the agar film can be peeled off and immediately placed first in a waxed paper envelope and then in the herbarium envelope. To prevent the wax from adhering to the dried agar, a disk cut from a photographic ferrotype plate may be superimposed on the wax so that the agar overlaps on to the latter, which holds it flat in drying.

SIMMONDS (P. M.). **A washing device for isolation work with plant material.**—*Phytopath.*, xx, pp. 911–913, 1 diag., 1930.

Full details are given of the construction and application of an apparatus for washing with sterile water pieces of plant tissue and seeds from which isolations are to be made. The material is inserted in an inverted flask which is attached to a pump. Sterile water is then drawn into the flask and the material agitated by an air current filtered through cotton wool. The water is then replaced by fresh sterile water and the process repeated a number of times. By means of this device the author has frequently obtained from

cereal rootlets an increase in isolations of 100 per cent. over the usual practice of surface sterilization with mercuric chloride or other chemicals.

TAKAMATSU (M.). **Studien über die Mykorrhiza-Pflanzen im Solfataren-Gebiete auf dem Berg Hakkoda.** [Studies on the mycorrhiza plants in the solfatara region on Mount Hakkoda.] —*Science Reports Tôhoku Imper. Univ.*, Ser. 4 (Biology), v, 3, pp. 607–614, 6 figs., 1930.

Mycorrhiza were found to be associated with 22 out of 28 species of plants examined at the botanical laboratory on Mount Hakkoda, Japan, three types being represented, viz., ectotrophic, heterotrophic, and endotrophic.

The ectotrophic mycorrhiza fell into two groups, composite and simple, the former (found on *Pinus pumila*) composed of subhyaline hyphae, occasionally with a black patch on the outermost layer of the fungus mantle, which envelops a number of the forked roots and fills up the spaces between the branches until a dense root mass is formed. Two fungi are believed to be involved in this process. The simple mycorrhiza, involving only a single root, may be subdivided into two types, one forming hyphae which penetrate down between the radially elongated epidermal cells, separating the latter from each other, though they are still united below with the outer layer of cortical cells. In this way the so-called Hartig's network is formed, and in surface view an appearance resembling that of an endotrophic mycorrhiza is presented. In the second type the mycelium is wholly superficial. The first type occurs on *Betula ermanni* var. *communis*, *B. maximowicziana*, and *Salix reinii*, and the second on *Pinus pumila*.

The heterotrophic type was observed only on *P. pumila*. The hyphae not only penetrate the intercellular spaces and the interior of the cells but form a mantle on the root surface like ectotrophic mycorrhiza. The hyphae in the intercellular spaces are more slender than those in the cells, and the latter differ from those of the endotrophic mycorrhiza in their sparse distribution in the epidermis and adjacent cortical layers. The heterotrophic mycorrhiza is considered to represent a transition stage between the ectotrophic and endotrophic types.

The last-named fall into two groups, viz., those in which the hyphae occur only in the epidermal cells, and those in which they are found exclusively in the cortex. The former type was found in a number of Ericaceae, including *Vaccinium vitis-idaea* [cf. *R.A.M.*, iv, p. 303]. The hyphae form a tangled, pale yellowish mass in the epidermal cells near the root tip, which also contain hyaline hyphae, probably belonging to another fungus. Eventually the epidermal cells disappear so that the outermost layer of the roots is formed of cortical cells, which also contain new hyphae, somewhat thicker than the foregoing. The latter type, found in various Gramineae, e.g., *Miscanthus sinensis*, and plants of other families, is characterized by the presence in the cortical cells of very thick hyphae, forming a solid, tangled mass. In both types the infected cells are hypertrophied.

AURET (THEODORA B.). **Observations on the reproduction and fungal endophytism of Lunularia cruciata (L.) Dumortier.**—*Trans. Brit. Mycol. Soc.*, xv, 1–2, pp. 163–176, 8 figs., 1930.

In giving some details of the reproduction of the liverwort *Lunularia cruciata* [*R.A.M.*, ix, p. 261] in South Africa (where only the archegonial form of the plant occurs), the author states that the thalli examined by her contained an endophytic fungus. The latter was found to occupy a definite zone of the gametophyte, below the assimilating tissue, and also to occur in the rhizoids and amphigastria; it does not, however, penetrate the gemmae cups and archegonia. Inside the host tissues the mycelium consists of branched, septate hyphae with granular contents, giving rise to vesicles, arbuscles, and sporangioles, but it was never seen to form fructifications inside the tissues.

In pure culture on glucose or protein agar the organism produced delicate, hyaline hyphae which, on the tenth day from inoculation, began to form pycnidia; when mature most of the latter were flask-shaped with a definite beak or neck, and measured 112·5 to 165 by 75 to 112·5 μ, while others were more elongated with a less well-defined neck and 350 by 30 to 60 μ in diameter. The pycnospores were oval and averaged 5·4 by 1·6 μ in diameter. The fungus is described as a new species of *Phoma* which is named *P. lunulariicola*, and of which a brief Latin diagnosis is appended.

The amount of the fungus present in the thallus appeared to be correlated with the habitat of the latter, and the association between the two organisms appears to be one of harmless parasitism on the part of the fungus.

ERIKSSON (J.). **Phytopathologische Mitteilungen. II.** [Phytopathological notes. II.]—*Arkiv. för Bot.*, xxiii A, 3, No. 7, pp. 1–18, 6 pl., 3 figs., 1930.

(1) In fixed material of hollyhock (*Althaea rosea*) leaves inoculated with the sporidia of *Puccinia malvacearum* [*R.A.M.*, iv, p. 376], the incipient formation of germ-tubes could be detected within 10 to 24 hours after infection, penetration occurring at the point of the epidermal wall to which the sporidium was adherent. A minute, barely visible pore is formed at the point of contact, through which the contents of the sporidium are extruded and pass into the epidermal cell. An elongated, slightly curved germ-tube then crosses the cell obliquely towards its inner wall. The presence of this germ-tube in the epidermal cell stimulates the development of the nucleus to such an extent that it almost attains the size of those of the palisade cells. By the end of three days several transverse septa had formed in the germ-tube, which was also branched in places. Infection hyphae were thus sent out into the adjacent palisade cells and intercellular spaces. In the nutritive palisade cells the infection hypha assumed a considerable thickness and became divided into short cells alternately full of protoplasm and empty, whereas in the intercellular spaces it developed as a long, narrow, simple or branched hypha until it reached another palisade cell into which it could send a haustorium. In these artificial inoculations, however, the infected zone remains

small in contrast to the often total leaf infection observed in nature. The latter is believed to arise by a symbiotic intermingling of the protoplasm of host and parasite, resulting in the production of a mycoplasm. The development of this can be traced around the margin of the inoculated zone. Certain cells show the formation of bodies resembling nucleoli but arising directly in the protoplasm without any previous rupture of the nucleus. From these, protoplasmic processes are sent out into the intercellular spaces where they can fuse with others from neighbouring cells, assume a hyphal form, and give rise to a teleutospore-forming mycelium.

(2) Investigations on the currant rust (*Puccinia ribis*) [ibid., ix, p. 599], begun in 1896 and pursued during the years 1903, 1907–9, and 1929, have shown that this fungus belongs to the section *Micropuccinia*, having only teleutospores which cannot germinate or develop until they have overwintered in the open. The rust has a special form on red currant (*Ribes rubrum*), viz., f. sp. *rubri*, which is not transmissible to black currant (*R. nigrum*) and probably not to gooseberry (*R. grossularia*). Outbreaks of the rust in the summer may occur either by the agency of overwintered teleutospores after an incubation period of 29 to 39 days, or by means of thick-walled, plasma-filled resting cells (chlamydospores) in the overwintered axillary leaf buds, the latter being possibly the more frequent method. The cortex of the petiole of diseased, pustule-bearing leaves contain cells, often arranged in rows, filled with a turbid colloidal mass which, on powerful magnification ($\frac{1700}{1}$), reveals a pulpy consistency, and may be regarded as a symbiotic mycoplasmatic blend between the host cell and the fungous protoplasm.

STEVENS (F. L.). **Relation of nutrients to perithecial production under ultra-violet irradiation.**—*Philipp. Agric.*, xix, 5, pp. 265–272, 2 figs., 1 diag., 1930.

The writer describes the results of experiments conducted to determine whether or not the sexogenetic response to irradiation of *Glomerella cingulata* [*R.A.M.*, viii, p. 190] may be modified by the application of nutrient or other substances to the culture media. The strain G 10–15 produced perithecia only on irradiation, the process being greatly stimulated by the addition of sucrose, levulose, or maltose to the cultures, and to a lesser extent by that of raffinose, lactose, and galactose. The sugars exerted a similar action on mycelial growth. In the strain G 9–2 perithecia developed in profusion on both the irradiated and non-irradiated sides of the colony, but only on the part receiving the nutrient in the case of all the sugars except lactose, which failed to induce perithecial formation on either the irradiated or non-irradiated areas. The addition of various vitamins to the cultures also failed to stimulate perithecial formation. The strain G 2–12, in which no perithecia had previously been formed under any conditions, produced these bodies in the irradiated areas of cultures to which pepsin, raffinose, or magnesium sulphate was added. There is some evidence, not yet regarded as conclusive, that irradiation produces a substance within the mycelium which leads the new outgrowths to assume a perithecial character.

STEVENS (F. L.). **The response to ultra-violet irradiation shown by various races of Glomerella cingulata.**—*Amer. Journ. of Botany*, xvii, 9, pp. 870-881, 9 figs., 1930.

Continuing his researches on the reaction of various strains of *Glomerella cingulata* to ultra-violet irradiation [see preceding abstract], the writer found that the perithecia of the fungus are produced in three different ways, namely, (1) in dense clusters of 50 to several thousand individuals, forming a hard, black mass often reaching 5 mm. in diameter; (2) in small clumps; and (3) scattered, usually solitary, but occasionally in groups of two to a dozen. The individual perithecia composing the dense clusters mentioned under (1) may be globose, 45 to 60 or up to 185 μ in diameter, then flask-shaped and beaked, with a total height from base to beak tip of 240 μ. This mode of perithecial production is stated to be rare, and did not occur in irradiated cultures, while the second, in which the individuals are globose and non-rostrate, was observed only in one strain and as the result of irradiation. The scattered, solitary perithecia normally developing in irradiated cultures are globose, non-rostrate, and very numerous (about 100,000 to a Petri dish in the case of strain G 10–15). Perithecia of this type also occurred regularly in certain non-irradiated strains. Very occasionally the writer observed the development of a crop of perithecia on the non-irradiated half of the plate long after the maturation of the first crop induced by direct irradiation, or on very old, non-irradiated plates. No perithecia were produced in normally non-perithecial strains as a result of intensified irradiation.

A study of some 50 monosporous cultures of *G. cingulata*, from conidia from apple or received from other laboratories, indicated that the formation of acervuli is strongly influenced by irradiation. The production of these bodies was subject to certain irregularities which were not manifested in the case of perithecial formation, but, generally speaking, slightly greater energy was required to induce the development of acervuli than to stimulate that of perithecia. Among the above-mentioned cultures some produced perithecia readily, others only acervuli. Some bore perithecia whether irradiated or not, others produced none, while in other cases again irradiation was necessary for perithecial formation. Setae are sometimes abundant and in other cultures entirely absent. Thus it is possible to distinguish numerous strains of the fungus; these strains should be regarded as 'elementary species' or perhaps 'jordanons' of Lotsy.

Mutations were observed to occur through sectors which differed in colour of colony (pale to dark), abundance of appressoria and acervuli, and in perithecial response to irradiation. Some of these variants remained true to their new characters, while others gradually or suddenly reverted to their original type. Strain G 7, which gave perithecia with or without irradiation, was inoculated into an apple; here it sectored into two strains of very different characters, viz., G 7–1, pale tan-coloured with numerous pink acervuli, and G 7–2, which was black and devoid of acervuli. G 7–1 produced perithecia only in response to irradiation, while

G 7–2 formed these bodies whether irradiated or not. These two strains retained their new characters through many transfers. This case is considered to be of special interest as an instance of mutation in the natural habitat of the species.

HUTCHINSON (A. H.) & ASHTON (M. R.). **The effect of radiant energy on growth and sporulation in Colletotrichum phomoides.**—*Canadian Journ. of Res.*, iii, 3, pp. 187–199, 1 pl., 11 graphs, 1930.

The experiments described in some detail in this paper were made for the purpose of ascertaining the effect of ultra-violet radiation [see preceding abstracts] on the growth and sporulation of *Colletotrichum phomoides*, the causal organism of tomato anthracnose [*R.A.M.*, iii, p. 83; viii, p. 140]. Three-day-old cultures of the fungus on bacto potato dextrose agar were subjected for varying periods of time, at a distance of 12 cm., to irradiations from a Cooper-Hewitt quartz mercury arc lamp, and beginning from the next day careful measurements were made of the amount of growth. It was found that irradiation for three minutes caused permanent stunting, from which the cultures did not recover, while irradiation for one and two minutes caused stunting directly related to the length of exposure, but from which the cultures returned to normal growth. An exposure of thirty seconds or less caused a slight initial stunting which was followed by a stimulation of growth. About 24 hours after irradiation the cultures showed numerous acervuli, mostly in clumps, while under normal conditions of light cultures usually remain free from acervuli until about eight days old. The maximum development of the acervuli resulted from exposures for 30 seconds to 1 minute; longer exposures accelerated the formation of the acervuli, but they were produced in smaller numbers.

Irradiation of *C. phomoides* spore suspensions in sterile water for periods of over 30 seconds caused an intensive initial retardation of growth on the nutrient medium, from which the cultures never recovered; 15 seconds' exposure also caused initial retardation, but subsequently the rate of growth gradually increased without, however, ever reaching the normal. The effect of irradiation for periods of time up to 5 or 6 minutes on the germination of the spores was in no case complete inhibition, but the proportion of spores that germinated decreased with the increase in the length of exposure.

The experiments also included irradiation of the cultures and spores with monochromatic light, as projected through Hilger's monochromatic illuminator, for periods of two hours each. The results showed that the specific lines of the mercury arc spectrum fall into four groups, according as they cause continued retardation, retardation followed by stimulation, general stimulation, and no appreciable effect (wave length λ 4359 Å only).

The experiments show that the effect of irradiation is upon the protoplasm of the fungus, and not upon the culture medium [cf. ibid., ix, pp. 48, 400], since the results obtained by irradiating spores only and cultures are similar.

VASUDEVA (R. N. S.). **On the occurrence of 'false sectors' in cultures of Fusarium fructigenum Fr.**—*Trans. Brit. Mycol. Soc.*, xv, 1–2, pp. 96–101, 1 pl., 1930.

The investigation briefly reported in this paper showed that certain strains of *Fusarium fructigenum* [*R.A.M.*, vii, p. 475; ix, p. 657] in pure culture give rise to sectors strongly diverging from the parent, and mainly characterized by a much greater growth of aerial mycelium with corresponding reduction in the amount of sporulation. The formation of these sectors was shown to be dependent on the shallowness of the nutrient medium and on the presence in the latter of an acid phosphate. A large proportion of the sectors were further shown not to be constant saltants, since on isolation and reculture they reproduced the parent strain.

YOUNG (P. A.) & MORRIS (H. E.). **Researches on Potato-virus diseases in Montana.**—*Montana Agric. Exper. Stat. Bull.* 231, 51 pp., 9 figs., 1 diag., 1930.

In this account of investigations conducted from 1924 to 1929, inclusive, into virus diseases of potatoes in Montana the authors note that spindly top appeared as a late season symptom of rugose and crinkle mosaics [*R.A.M.*, ix, p. 475] on individual plants in the greenhouse, and state that by means of leaf-mutilation inoculations and tuber-core grafts rugose mosaic was transmitted from diseased to healthy potatoes in 75 out of 127 attempts, the core-graft inoculations usually producing secondary symptoms. It was also transferred from Irish Cobbler potato leaves to tomatoes (4/4 successful) and tobacco (6/10), when it caused mottling. The incubation period usually ranged from 21 to 40 days. The disease was also successfully inoculated into potatoes already showing mild mosaic, leaf-rolling mosaic, or spindle tuber, supporting the view that the four viruses are different. When rugose mosaic was inoculated into potatoes already having the secondary symptoms no new symptoms developed, indicating that the two sets of symptoms are caused by one and the same virus. Necrotic leaf spots were an important sign of the presence of the disease.

Heavy infestations of healthy Bliss Triumph potatoes in the greenhouse by non-viruliferous individuals of *Macrosiphum solanifolii* [*M. gei*] produced brown dots and general browning of the veins. Similar infestations by non-viruliferous individuals of *Myzus persicae* produced dwarfed, spindly tops and dwarfed, curled leaflets on previously normal potatoes.

Leaf-rolling mosaic, super-mild mosaic, mild mosaic, spindle tuber, unmottled curly dwarf [ibid., x, p. 50], witches' broom [ibid., viii, pp. 122, 155], and leaf roll were transmitted by core-grafts.

Intracellular spherical or hemispherical bodies, mostly in or near necrotic spots on brittle, rolled leaves, had diagnostic value in leaf roll [cf. ibid., ix, p. 799], of which interveinal yellowing was a common symptom.

A condition referred to as 'curly flavescence', characterized by a prominent downward curling of many leaflets, diffused mottling which often disappeared as the leaves matured, moderate chlorosis,

dwarfing, and severe brittleness of the leaflets and stems, caused a reduction in yield of 90 per cent.; numerous efforts at transmission being unavailing, it is regarded as being, possibly, a genetic abnormality. In view of similar failures to transfer calico [ibid., iii, p. 192], this is also provisionally considered to be of similar nature.

Observations indicated that unmottled curly dwarf is distinct from spindle tuber [ibid., x, p. 50]. The tuber symptoms of the former consisted of depressed, brown, corky lesions.

Roguing was very effective in eliminating crinkle mosaic, leaf roll, and spindle tuber from seed stocks.

In three years' tests with Bliss Triumph and Netted Gem potatoes spindle tuber caused an average reduction in yield of 42·8 and 68 per cent., respectively, while crinkle mosaic gave an average reduction of yield in Irish Cobbler potatoes of 41·7 per cent. In two years' tests mild mosaic reduced the yield in the Idaho Rural variety by 23·1 per cent., and super-mild mosaic reduced it by 19·1 per cent. in Netted Gem.

A bibliography of nearly 100 titles is appended.

ROCHLIN (EMILIA). **Zur Anatomie der mosaikkranken Kartoffelpflanzen.** [On the anatomy of mosaic-diseased Potato plants.] —*Phytopath. Zeitschr.*, ii, 5, pp. 455–468, 3 pl., 1930.

Studies on the anatomy of virus-diseased potatoes, conducted at Prof. Jaczewski's mycological laboratory, Leningrad, have shown that destructive alterations in the phloem tissues are associated, not only with leaf roll, but also with rugose mosaic, 'Bukettkrankheit' (curly dwarf), and stipple-streak. The pathological changes in the phloem were accompanied by alterations in other tissues, e. g., the medullary and cortical cells, indicating that the diseases in question produce generalized and not merely local effects.

The diseased plants showed the following alterations: dissociation between growth and tissue development; destructive changes in the tissues, sometimes accompanied by hypoplasy; and asymmetrical development of certain organs. These changes are common to all the above-mentioned virus diseases, but the actual nature of the symptoms varies according to the site and intensity of the infection.

The dissociation is manifested by a check in growth, while the differentiation of the tissues continues. This is especially marked in the stem but occurs also in the petioles and midribs, and results in the early appearance of changes normally found only at full maturity, e. g., increase in sclerotic tissue, bast fibres, collenchyma, secondary medullary rays, and the like, with decreased cortical parenchyma and loss of the starch sheath. These changes, normally found in stems 10 to 20 mm. thick, appear in the diseased stems while they are only 3 to 5 mm. in diameter.

The three types of phloem alterations, viz., necrosis, necrobiosis, and obliteration, recognized by v. Brehmer [ibid., iii, p. 417], were found in both mosaic and curly dwarf, necrobiosis being much more extensive in the diseased than in healthy plants and, therefore, to be regarded as a definite pathological process. The destruction of phloem elements cannot be considered to be confined to

the leaf roll type of virus disease. In the perimedullary zone there is a thickening of the cellulose walls in diseased plants, and the collenchyma of the cortex may swell so as to form a structureless mass. Necrosis of the pith and cortical cells was also observed, the small patches of necrotic cells becoming surrounded by thin-walled dividing tissue. A hypertrophy of the subepidermal chlorophyll-containing cells of the cortex, with destruction of the chlorophyll, also occurred. Hypoplasy of the xylem was found in the stem of mosaic-affected plants, and in the midribs the collenchyma was reduced or entirely wanting. The leaf parenchyma also showed hypoplasy and the cells of the paler parts of the leaf were found to undergo fatty degeneration.

OPITZ. **Beobachtungen und Versuchsergebnisse über den Abbau der Kartoffel in Dahlem.** [Observations and experimental results in connexion with Potato degeneration at Dahlem.]—*Pflanzenbau, Pflanzenschutz und Pflanzenzucht*, vii, 5, pp. 129–138, 1 graph, 1930.

The results of the writer's observations and experiments, extending over a period of six years at Dahlem, Berlin, on the correlation between environmental conditions and degeneration in potatoes, are tabulated and discussed in considerable detail. The degenerative phenomena included rolling of the leaves, dwarfing of the plants, and a reduction in yield. The prevalence of degeneration in 1926–7 is thought to have been due to the heavy rainfall and low temperatures in the summer of both years, combined with abnormally mild spring and autumn weather. The growing season of 1928 was characterized by a protracted dry spell, following which degeneration was practically absent. In 1929, however, the condition again became prominent as a result of the excessively heavy rainfall in October, 1928 (100 mm. compared with a normal precipitation of 44 mm.), followed by relatively mild weather in December and January. It is apparent from these data that meteorological conditions play a certain part (the extent of which cannot yet be accurately gauged) in increasing the degeneration of the potato.

In a series of tests in which Deodara and Parnassia tubers were grown in nine different types of soil, the heaviest yields were obtained on heavy clay, the light sandy and marshy soils generally reputed to give prolific harvests being inferior in this respect [cf. *R.A.M.*, vii, p. 593], but the part played by soil conditions relatively to other factors in the development of degeneration is not yet clear. Experiments with the Deodara, Preussen, and Industrie varieties to ascertain the effect of harvesting at different dates (1st and 25th August and 10th October) gave no clear indication of the superiority of early over late lifted tubers in respect of virus diseases [ibid., viii, p. 457]. The cultivation of potatoes of several commercial varieties under gauze cages to exclude aphid infestation failed to give conclusive proof of the efficacy of this procedure against degeneration. The results of chemical analyses of the composition of potato tubers lend no support to Lindner's theory [cf. ibid., vi, p. 685] that freedom from degenerative phenomena

is associated with a high non-albuminous nitrogen content in the form of amino acid.

COSTANTIN (J.). **Les certificats phytopathologiques de non-dégénérescence de la Pomme de terre dans l'Amérique du Nord.** [Phytopathological certificates attesting the freedom of Potatoes from degeneration diseases in North America.]—*Comptes rendus Acad. des Sciences*, cxci, 14, pp. 534–536, 1930.

In this brief note the author reviews the results obtained in the United States and Canada in the control of degeneration [virus] diseases of potatoes by the use of seed tubers grown in northern regions or at high altitudes and certified to be free from such diseases. He concludes that the controlling effect of cold climates on virus diseases of the potato is probably due (1) to a limitation of their spread, (2) to the facilitation of the selection of healthy plants, and (3) to the fact that the climate may have a curative effect on the diseases, though this point needs further confirmation [see next abstracts].

LEBARD (P.). **Relations entre l'altitude, l'humidité et les substitutions de dégénérescence de la Pomme de terre.** [Relations between altitude, humidity, and the forms of degeneration of the Potato.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 30, pp. 999–1004, 1 map, 1930.

Details are given of the incidence of the various types of degeneration—mosaic, crinkle, and leaf roll—observed among the potato crops inspected by the writer during a recent visit to the French Alps. All the diseases were found at every altitude, but mosaic and crinkle were most prevalent at a medium height in damp, fertile regions, while leaf roll predominated in the dry climate of the higher altitudes. The distribution of the various diseases in the different localities is shown by a map. On pp. 1004–1005 some observations are made by Costantin on analogous data relating to the degeneration diseases of potatoes in other countries.

COSTANTIN (J.) & LEBARD (P.). **Cultures expérimentales de Pommes de terre dégénérées et saines en montagne et en plaine.** [Experimental cultures of degenerated and healthy Potatoes in the mountains and the plains.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 30, pp. 1006–1010, 1930.

In order to test the alleged superiority of potato stocks from mountainous regions in respect of freedom from degeneration [*R.A.M.*, vii, p. 802 and preceding abstracts], the writers compared the yields of experimental cultures (*a*) of unselected tubers from various localities of the French Alps, and (*b*) of healthy tubers grown at the Laboratory of Plant Biology, Fontainebleau. It was found that the yield of the latter considerably exceeded that of the mountain stocks, showing that the favourable influence of the climate at high altitudes cannot operate unless rigid selection is practised.

BAILEY (H. L.). **Report of seed Potato certification service 1928–30.**—*Fifteenth Bienn. Rept. Vermont Commissioner of Agric., 1928–1930*, pp. 24–28, 1930.

The area of potatoes entered in Vermont for seed certification in 1928 [cf. *R.A.M.*, viii, p. 331] was the largest in the history of the service, viz., 1,185 acres submitted by 250 growers; in 1929 the total area entered by 149 growers was 1,004 acres. However, owing to an unprecedented increase of leaf roll and mosaic, the percentage of acreage certified was considerably lower in both years than had been the case for several seasons previously. The total acreage passed in 1928 was 635 and, in 1929, 502. It was found that seed from certain fields showing very little disease developed a high percentage of leaf roll or mosaic in the next season. Prince Edward Island and the northern edge of New Brunswick, next to the Bay of Chaleur, are generally regarded as the safest sources of foundation stock, while within the State of Vermont the north-eastern sections, especially near Greenboro, are superior to the southern for this purpose.

SCHANDER (R.) & STAAR (G.). **Untersuchungen über die Bekämpfung der durch Phytophthora infestans hervorgerufenen Kraut- und Knollenfäule der Kartoffeln mit besonderer Berücksichtigung der kupferhaltigen Stäubemitteln.** [Investigations on the control of late blight of Potatoes caused by *Phytophthora infestans*, with special reference to copper-containing dusts.]—*Arb. der Kartoffelbaugesellsch.*, xxxiii, pp. 1–138, 14 figs., 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 8–14, p. 273, 1930.]

The optimum concentration of Bordeaux mixture for use against *Phytophthora infestans* on potatoes is stated to vary according to local conditions; where a thundery tendency prevails or in the vicinity of industrial concerns, the rain is richer in carbon dioxide, so that the copper in the spray is more rapidly dissolved. Ready-made Bordeaux powders give mixtures of inadequate suspensory capacity or resistance to rain. The latter factor was determined on glass slides by spraying with water (½ minute, 15 cm. distance, 1¼ atmospheres pressure). A 2 per cent. Bordeaux mixture was found to dry rapidly, so that the amalgamation of the colloids takes place in the phase of fine dispersion, and 85·7 per cent. of the copper adhered after spraying with water. The satisfactory degree of resistance to rain of this mixture was further enhanced by an addition of sugar (91·2 per cent. copper adhered). Cuprosol mixture showed little resistance to rain.

The efficacy of the copper dusts was tested by the following methods. Resistance to removal by wind was measured by exposing weighed dusted slides to air blown from a distance of ½ m. from a ventilator for 30 seconds, and the loss of weight determined. This test must be carried out immediately after the application of the dust, since otherwise the latter settles. Resistance to shaking was estimated by means of a special apparatus, in which the dusted slide, placed in an upright position, fell vertically a distance of 1 cm. The adhesive capacity of various

copper dusts, based on the size and shape of the particles as well as electrical properties, was ascertained by allowing a certain amount of dust to trickle on to a slanting glass slide. The dusting capacity was tested by blowing the dust at a given atmospheric pressure on to a vertical glass slide, thus making as it were a section through the dust cloud.

GRATZ (L. O.). **Effect of seed Potato treatment on yield and rhizoctoniosis in Florida from 1924 to 1929.**—*Florida Agric. Exper. Stat. Tech. Bull.* 220, 34 pp., 1 graph, 1 map, 1930.

A consideration of the results [which are fully discussed and tabulated] of six years' experiments, in the Hastings potato belt, Florida, in the control of rhizoctoniosis (*Corticium vagum*) [*C. solani*] by various seed treatments [*R.A.M.*, ix, pp. 403, 404] indicate that these are unwarranted [ibid., vi, pp. 115, 209]. Few significant increases of yield were obtained either with corrosive sublimate or hot formaldehyde, while in numerous cases actual reductions were recorded as a consequence of the treatment. The organic mercury compounds not only failed to augment production under the local conditions but caused definite injury in certain tests.

A survey of recent American literature on the subject of seed potato treatment against *C. solani* is stated to reveal the following facts. Notwithstanding extensive efforts to improve the process of disinfection by various methods, 27 States still adhere to the use of cold corrosive sublimate, 5 advocate the use of hot formaldehyde only, 4 regard these two materials as equally effective, only 2 definitely recommend the employment of organic compounds, 3 suggest either the new compounds or the old standard formula, 2 propose modifications in the latter by the addition of acid or increase of temperature, while 4 offer no recommendations.

A bibliography of 92 titles is appended.

WEBER (G. F.) & WEST (E.). **Diseases of Sweet Potatoes in Florida.**—*Florida Agric. Exper. Stat. Bull.* 212, 40 pp., 24 figs., 1930.

Popular notes are given on the symptoms and control of a number of diseases of sweet potatoes in Florida, the annual loss from which is estimated at 10 to 20 per cent. of the crop. Among these may be mentioned black rot (*Ceratostomella fimbriata*); scurf (*Monilochaetes infuscans*) [*R.A.M.*, x, p. 54]; pox (*Actinomyces* sp.) [ibid., viii, p. 598]; stem rot (*Fusarium batatatis* and *F. hyperoxysporum*) [ibid., ix, p. 335, and next abstract], to which the 'Spanish' variety group, including Dahomey, Red Brazilian, Pierson, Southern Queen, Porto Rico, and Yellow Strassburg, have been found resistant, while the 'Jerseys' are susceptible; southern blight (*Sclerotium rolfsii*); *Plenodomus destruens* [ibid., x, p. 110], characterized by premature yellowing and dying of the leaves and a firm, brown decay of the stems on which the small, black pycnidia are developed; ordinary mosaic and a second type of the disease closely resembling the transmissible mosaics of tobacco, cucumber, tomato, and other plants [see above, p. 213]; leaf blight (*Phyllosticta batatatis*); a smoky-brown leaf spot due to a species of

Cercospora apparently restricted to Florida; Java black rot (*Diplodia tubericola*) [ibid., ix, p. 375] and soft rot (*Rhizopus nigricans*), both causing heavy losses in storage; and various disturbances of minor importance.

POOLE (R. F.). **A control for Sweet Potato wilt or stem rot.**—*North Carolina Agric. Exper. Stat. Bull.* 273, 3 pp., 3 figs., 1930.

The writer has obtained good control of wilt or stem rot of sweet potatoes (*Fusarium batatatis*) [see preceding abstract] on the sandy soils of North Carolina by the immersion of the stems and roots, before transplanting, in a strong Bordeaux mixture (1 lb. copper sulphate, 1 lb. lime, and 2·5 galls. water). In 1929 very satisfactory results were obtained by growers at a cost of less than 16 cents per acre (calculating the price of copper sulphate at 8 cents per lb.). Where scurf [*Monilochaetes infuscans*] is present in the same field mercurichlorophenol (1 in 10) should be used for the combined control of both diseases. The Porto Rico, Nancy Hall, Norton Yam, Yellow Jersey, and Big Stem Jersey are susceptible to *F. batatatis*, while Southern Queen, White and Yellow Yams, Red Brazil, and Triumph are resistant.

DODOFF (D. N.) & KOVAČEVSKI (I. C.). Предварителни проучвания върху чалгъна по Ориза въ България. [Preliminary study of the blast disease of Rice in Bulgaria.]—*Българско Земледѣлско Дружество, Научни Трудове.* [*Scientific Trans. Bulgarian Agric. Soc.*], Sofia, 25, 61 pp., 5 pl., 2 graphs, 1930. [English summary.]

This report embodies the results attained so far by the authors in their study of a very serious disease of rice in Bulgaria, which appears to be identical with the condition known as 'blast' in America and 'imotsi' or 'imochibyo' in Japan [cf. *R.A.M.*, vii, p. 394], and to have some features in common with the 'brusone' of rice in Italy. After noting the divergences of opinion regarding the causes of blast in other countries, it is stated that, in Bulgaria, the disease is probably caused by *Piricularia oryzae* [ibid., viii, p. 124; ix, p. 556] and *Sclerotium oryzae* [ibid., ix, p. 484], the former of which is more widely distributed than the latter. Isolations from rotten rice straw also yielded a strain of *Sclerotium* which proved to be identical with Sakurai's *S.* No. 2 [ibid., viii, p. 263]. Brief descriptions are given of the morphology of the fungi and of the symptoms caused by them on rice plants.

In Bulgaria the disease usually appears during the latter part of the summer, its destructiveness increasing with the earliness of its appearance. Under favourable conditions, e.g., abundant dews or rains, fogs, cloudy weather, and the like, at the time of heading or immediately after, it may rapidly spread over whole fields from a few infection foci, usually near to the source of water, and practically destroy the whole of the crop. In general, all conditions tending to increase the relative humidity inside the rice stands favour the development of the disease.

P. oryzae was shown to overwinter as conidia on rice seeds, the straw, and infected stubble, and also as mycelium on straw and

stubble [ibid., viii, p. 197]. The conidia retained their viability for over 17 months when kept at room temperature under dry conditions, and under the same conditions the mycelium survived for over 28 months in diseased rice nodes. *S. oryzae* overwinters as sclerotia and mycelium on the stubble. The chief control measures recommended are the cultivation of uniform, well-aerated fields, and the use of resistant varieties of rice, and in the case of *S. oryzae* burning of the stubble, suitable crop rotation, and the isolation of the infected parts of the rice fields.

Besides this disease, rice in Bulgaria also suffers from straighthead [ibid., vii, p. 493], and in 1929 *Sclerospora macrospora* was observed on it in a few localities.

BEELEY (F.). **Notes on recent observations on Oidium heveae.**—*Quart. Journ. Rubber Res. Inst. Malaya*, ii, 3, pp. 182–183, 1930.

Investigations conducted in Malaya to ascertain how *Oidium heveae* [*R.A.M.*, ix, p. 803; x, p. 205] carries over from year to year without any known resting spore stage showed that the conidial stage was present on the inflorescences at all seasons. Flowers formed from the terminal buds of leading branches were almost invariably infected, and a few days after the bud had opened the fungus was actively sporulating on the flower buds and floret stalks. Flowers formed from lateral buds appeared to become infected at a later stage. Stems and young leaves on infected trees remained unaffected between June and September; young leaves which developed at the end of September or in October bore small patches of the active fungus on the midrib. Living, germinating spores were present in the axils of mature leaves, in the bud scales of terminal buds, and on seed pods. As a terminal bud just opening was found to be actively infected, the tissues of such buds serve, apparently, to carry over the fungus during inclement weather or when new young leaves or flowers are not present. After heavy rain the conidiophores and spores disappeared, but fresh conidiophores developed from the surface mycelium after a few days of dry weather. Young, infected inflorescences developed chains of 2 to 4 spores within two days of being brought into the laboratory at a temperature of 25° to 32° C., while in a cool chamber (11° to 14°) rapid growth with the production of numerous conidiophores bearing chains of 3 to 7 spores was obtained on living *Hevea* flowers in the same period.

COOK (M. T.). **Distribución geográfica de las enfermedades de la Caña de Azúcar.** [Geographical distribution of Sugar-Cane diseases.]—*Rev. Agric. Puerto Rico*, xxv, 5, pp. 170–172, 1 chart, 1930.

A chart is given, with explanatory notes, showing the distribution throughout the world of the fungous, bacterial, and physiological diseases and insect pests of sugar-cane.

[This paper also appears (with the addition of a map) in *Facts about Sugar*, xxvi, 1, pp. 24–26, 1931.]

Faris (J. A.). **El dominio del mosaico de la Caña de Azúcar en el campo Cubano.** [The range of mosaic of Sugar-Cane in Cuban plantations.]—*Bol. Unión Panamericana*, lxiv, pp. 968–983, 2 figs., 1 graph, 1930.

Sugar-cane mosaic is stated to occur in Cuba in well-marked zones, which may conveniently be divided into zones of low, medium, and high secondary spread [*R.A.M.*, viii, p. 810]. In the zones of low secondary spread any standard commercial canes may be cultivated provided that they are raised from healthy seed. In the zones of medium and high secondary spread the use of healthy seed should be combined with the choice of the less susceptible varieties, e.g., Cristalina and S.C. 12/4, which will probably eventually be replaced by the P.O.J. 2714, 2725, 2727, and 2728 varieties [ibid., viii, p. 667]. Generally speaking, the most intensive infection occurs in spring-sown cane, a fact that is doubtless correlated with the heavy rainfall during the period from May to October. Comparatively little mosaic is found in the autumn-sown cane developing during the dry season from November to April [ibid., vi, p. 752].

Smarods (J.). **Materiali Latvijas mikoflorai.** [Materials for the mycoflora of Latvia.]—*Acta Inst. Defens. Plantarum Latviensis*, i, pp. 43–46, 1930. [German summary.]

Continuing his researches on the mycoflora of Latvia [*R.A.M.*, ix, p. 271], the writer here enumerates 63 species of parasitic fungi recorded in 1929, chiefly attacking ornamental hosts and mostly new to the country.

Szulczewski (J. W.). **Przyczynek do zimowej mykoflory Poznania i okolicy.** [Contribution to the winter fungus flora of Posen and its environs.]—*Kosmos*, Lwow, lv, 1–2, pp. 232–248, 2 figs., 1930. [German summary.]

During the mild winter of 1928–9, which was practically free from snow in Poland, the writer investigated the fungus flora of Posen and its environs. Among the fungi examined and briefly annotated (180 in all) the following are of interest. *Puccinia arrhenatheri* formed witches' brooms on *Berberis vulgaris*, this being the sole locality from which the rust has been reported in Greater Poland. *Fomes ribis* was found on red currants and *Euonymus europaeus*. *Herpotrichia pinetorum* occurred on *Sarothamnus scoparius*. *Polyporus picipes* was observed on elm (*Ulmus* sp.) and ash (*Fraxinus excelsior*), *P. borealis* on spruce (*Picea excelsa*), and *Fomes lucidus* [*Ganoderma lucidum*], a rare fungus in Poland, on oaks (*Quercus robur*). *Trametes pini*, *T. odorata*, *Polyporus sistotremoides*, and *F. annosus* were found on pines, the last-named also on *Picea excelsa*. *Thelephora laciniata* occurred on *Vaccinium* bushes.

Terui (M.). **Additional list of the fungi collected in the islands of Rishiri and Rebun, Hokkaido.**—*Trans. Sapporo Nat. Hist. Soc.*, xi, 3, pp. 157–163, 1 fig., 1930. [Japanese summary.]

In this supplement to the list of fungi collected in the islands of Rishiri and Rebun, Hokkaido, Japan, published by Togashi in

Japanese Journ. of Botany, ii [p. 75], 1924, the writer enumerates a further 35 species of parasitic fungi (including one new species) collected in the same localities during July, 1930.

JØRGENSEN (C. A.). **Mykologiske Notitser. 3–10.** [Mycological notes. 3–10.]—*Bot. Tidsskr.*, xli, 3, pp. 227–239, 22 figs., 1930.

During the winters of 1928–9 and 1929–30 the writer observed the orange-yellow, discoid apothecia of *Pitya vulgaris* Fuck. in large numbers on freshly felled silver fir [*Abies pectinata*] trees which were still bearing needles. The cylindrical paraphysate asci measure 200 to 300 by 16 to 20 μ and contain eight globular, hyaline ascospores, 13 to 16 μ in diameter, which germinate readily; on sterilized fir twigs a loose, white, caespitose mycelium is formed, but no sign of conidial development was apparent after months of culture.

A study of *Brunchorstia destruens, Cenangium abietis, Crumenula abietina* (observed by the author, apparently for the first time in Denmark, on Scotch pine [*Pinus sylvestris*] branches in the spring of 1930), and *C. pinicola* [*R.A.M.*, viii, p. 686] led to the following conclusions. *C. abietina* may be found on *P. sylvestris*. red pine [? *P. resinosa*], and Austrian pine [*P. laricio* var. *austriaca*], always preceded by its conidial stage, *B. destruens*; monospore cultures of *C. abietina* gave rise to typical pycnidia of *B. destruens*, with which *C. pinicola* and *Cenangium abietis* are in no way connected [loc. cit.; ibid., vii, pp. 209, 553]. The closely woven, steel-grey mycelium of *Crumenula pinicola* shows no sign of conidial development after eight months in culture, while the luxuriant, caespitose, yellowish-green to black mycelium of *B. destruens* forms pycnidia containing falcate, tri-septate conidia after one to two months [ibid., vi, p. 706]. *Cenangium abietis* could not be induced to make any growth on artificial media.

The bark of apple trees affected by a superficial canker bore the white or cream-coloured, non-septate conidia, 27 to 34 by 9 to 11 μ, of *Myxosporium corticolum* [see above, p. 251]. After some time yellow, discoid apothecia developed on the diseased areas; they contained numerous asci, with eight hyaline, oval, bi-septate ascospores, 17 to 26 by 7 to 9 μ; the branched paraphyses were filiform to clavate. Monospore cultures of the ascospores on apple twigs yielded the mycelium and conidia of *M. corticolum*, thereby proving the genetic connexion between the two stages. The perfect stage of *M. corticolum* is named *Neofabraea corticola* n. sp., with a Latin diagnosis. The sole character of *N. corticola* differing from that of the type species *N. malicorticis* is the stalked apothecia of the former, but in view of the marked general agreement between the two organisms this point does not appear generically significant.

The perithecial stage of *Fusarium nivale* (*Calonectria graminicola*), hitherto unknown in Denmark, was found on rye in Jutland during June, 1930. The ascospores readily produced the luxuriant pink mycelium and conidia of *F. nivale* in culture.

Dothidea (*Plowrightia*) *virgultorum* [cf. ibid., iv, p. 96] attacks the current year's birch shoots, possibly also those of two and

three years old. Infection is believed to occur through the lenticels; the mycelium ruptures the bark, exposing stromata with incipient perithecia. The individual stromata are oblong, single or confluent, 1 to 12 by 2 to 4 mm., black externally and whitish within. The perithecia emerging from the stromata from January to May are occupied by numerous cylindrical to fusiform asci, 50 to 75 by 12 to 14 μ, usually furnished with a short, filiform basal stalk and containing eight uni- or biseriate, very irregularly bicellular, hyaline or pale greenish ascospores, 11 to 14 by 7 to 9 μ. After the liberation of the ascospores the stroma usually dries up and is often thrown off, its place being marked only by a deep scar extending as far as the wood; severely infected branches may be literally pitted with such scars, in which case they are generally killed. *D. virgultorum*, hitherto only known in Denmark from one locality, was found during the winter of 1929–30 in two new districts.

Massariella scoriadea (Fr.) Cooke, a rare fungus observed for the first time in Denmark in February, 1930, is also a parasite of birch twigs on which it inflicts much heavier damage than *D. virgultorum*. The bark is totally destroyed, as well as the cambium. The perithecia are formed in the outer cortical layers from which only the upper parts emerge with a short papillate ostiole; they measure 0·5 to 1 mm. in diameter and have black carbonaceous walls. The asci appear to dissolve readily, and the black, irregularly bicellular ascospores, measuring 60 to 65 by 19 to 24 μ and enveloped in a thick membrane, are liberated either through the ostiole or by the disintegration of the entire upper portion of the perithecium. The infected areas of the birch twigs assume a peculiar pitted aspect.

HOMMA (YASU). **Notes on the Erysiphaceae of Manchuria.**—*Trans. Sapporo Nat' Hist. Soc.*, xi, 3, pp. 169–174, 2 figs., 1930.

From a study of 19 species of Erysiphaceae belonging to six genera in the herbarium of the Hokkaido (Japan) Imperial University, the writer finds that two species of *Uncinula* are new to science.

U. kenjiana n. sp. (referred by Miura in his 'Flora of East Mongolia and Manchuria', Part iii, 1928, to *U. clandestina*) occurs on *Ulmus pumila* and is characterized by an amphigenous, evanescent mycelium; depressed-globose perithecia, 61·2 to 84 μ in diameter, with 7 to 15 simple, smooth, straight, aseptate, hyaline, thin-walled appendages, 70 to 136 μ long, the uncinate part suddenly enlarging to about twice the width of the rest of the appendage and coiling twice in an outward direction; 3 to 5 globose asci, with or without stalks, 44 to 57·6 by 33·6 to 44·4 μ, containing two ellipsoidal ascospores measuring 28 to 31.2 by 16·8 to 21·6 μ.

U. salici-gracilistylae n. sp. was found on *Salix gracilistyla* and is characterized by a hypophyllous, persistent mycelium; globose perithecia, 112 to 154 μ in diameter, with 56 to 87 simple, aseptate, hyaline, thin-walled appendages, swollen in places, with a circinate or falcate apex, 100 to 140 μ long; 6 to 8 ellipsoidal or ovate, short-stalked asci, 46·8 to 54 by 31·2 to 34·8 μ, containing 4 to 5

(rarely 3) elongated-ellipsoidal ascospores measuring 19·2 to 24 by 10·4 to 12 μ.

On the basis of these investigations the writer also makes the following changes in nomenclature; *U. tulasnei* on *Acer lobelii* var. *platanoides* is renamed *Sawadaea tulasnei* (synonym *S.* [*U.*] *aceris*) [*R.A.M.*, viii, p. 673], while *Phyllactinia suffulta* [*P. corylea*] var. *moricola* on *Morus bombycis* becomes *P. moricola.*

KLEBAHN (H.). **Zur Kenntnis einiger Botrytis-Formen vom Typus der Botrytis cinerea.** [Contribution to the knowledge of some *Botrytis* forms of the type of *Botrytis cinerea.*]—*Zeitschr. für Bot.*, xxiii (*Festschr.*), pp. 251–272, 5 figs., 1930.

A full account is given of the writer's comparative morphological studies on *Botrytis douglasii* v. Tub. (considered to be probably identical with *B. cinerea*), a virulent parasite of Douglas firs [*Pseudotsuga taxifolia*] in Germany [*R.A.M.*, ix, p. 617]; *B. parasitica* from tulips [ibid., vii, p. 378]; *B. convallariae* from *Convallaria majalis*; *B. narcissicola* from *Narcissus pseudo-narcissus* [ibid., viii, p. 40]; *B. galanthina* from *Galanthus* [*nivalis*: ibid., viii, p. 41]; *B. gladioli* n. sp, (isolated from gladioli near Hamburg and characterized by very dark conidiophores, small, narrow conidia, measuring 10·4 by 4·7 μ, in grape-like clusters, and jagged excrescences on the medium-sized ampullae); *B. cinerea* f. *primulae sinensis* from *Primula sinensis* (conidia 10·5 by 6·3 μ); *B. cinerea* f. *pruni trilobae* from *Prunus triloba* (conidia 9·2 by 5 μ); *B. cinerea* f. *syringae* from *Syringa vulgaris* (conidia 12·6 by 8·3 μ); and *B. cinerea* f. *vitis* from *Vitis vinifera* (conidia 12·6 by 6·8 μ).

All these species and forms of *Botrytis* produce ampullae, with the doubtful exception of *B. cinerea* f. *vitis*, and therefore belong to the subgenus *Phymatotrichum*, not *Polyactis.* Furthermore, they are all characterized by the development of irregularities and scars on the conidiophores and contraction of the terminal cells as a result of the abstriction of the conidia. The above-mentioned *B. gladioli* differs from the rest in morphological characters, as also does *B. trifolii* [loc. cit.], whilst *B. parasitica* is distinguished biologically, but the differences between the various forms are so slight that the author considers they can probably all be referred, together with various others, to the collective species *B. cinerea.*

Variations were observed in the virulence of the different forms towards their hosts, and it is suggested that extensive inoculation tests should be undertaken to determine the basis for strict parasitism on the one hand, and a quasi-saprophytic behaviour on the other.

GUYOT (A. L.). **Observations sur la distribution géographique comparée de quelques espèces végétales et de certains de leurs parasites végétaux. (1re Note).** [Observations on the comparative geographical distribution of some plant species and certain of their plant parasites. (First note).]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 8–9, pp. 359–365, 1930.

After referring to the importance of obtaining information as to the geographical distribution of plant parasites and their natural

hosts, the author records a number of observations recently made in this connexion in various parts of northern France. *Puccinia rübsaameni* [*R.A.M.*, ix, p. 399], previously reported in France on *Origanum vulgare* only in the Somme basin and the lower reaches of the Seine was found in July, 1930, on the same host, in the vicinity of Mantes, the most southern point at which it has yet been recorded in France, and where it appears to be spreading rapidly. The host plant is extremely widespread throughout Europe. *Ramularia ajugae* was recently observed on *Ajuga foliosa* in Lorraine, its most westerly record for Europe, throughout which the host is found. *Uromyces tuberculatus* was noted in September, 1929, at Famechon (Somme), its most northerly record in France; it had previously been reported from the departments of Aube, Seine-Inférieure, Lot, and the Eastern (Spanish) Pyrenees, as well as in Germany and Switzerland. Its host plant, *Euphorbia exigua*, is, like the others mentioned above, found throughout the whole of Europe.

GADD (C. H.). **The Armillaria root disease of Tea.**—*Tea Quarterly*, iii, 4, pp. 109–113, 3 pl., 1930.

A semi-popular account is given of the root disease of tea caused by *Armillaria mellea* as it occurs in Ceylon [*R.A.M.*, vii, p. 745]. The radial fissures found on the roots of tea in Java and cacao in the Gold Coast as the result of infection by *A. mellea* occur on seedlings, but are seldom to be observed on mature tea bushes, though they usually develop as the bush dries out in the laboratory. A conspicuous feature of infection by *A. mellea* in Ceylon is the development of black rhizomorphs on the cortex of the roots, a symptom which appears to be rare in nature under Nyasaland conditions [ibid., viii, p. 202]. The wood of tea bushes attacked by *A. mellea* is typically hard, dry, and divided into definite areas frequently demarcated by distinct black lines. No serious spread of the disease has occurred since its detection in 1927. In addition to tea, *Albizzia lophantha*, and *Acacia decurrens*, young *Grevillea* trees are also liable to attack by *A. mellea* in Ceylon. So far adequate control has been secured by the eradication and burning of diseased bushes and decaying stumps.

TISDALE (W. B.). **The Tobacco Experiment Station.**—*Ann. Rept. Florida Agric. Exper. Stat. for the year ending June 30, 1929*, pp. 97–102, 5 figs., 1929. [Received February, 1931.]

Trials of 148 different varieties and strains of cigar and 2 of cigarette wrapper tobacco for resistance to black shank (*Phytophthora nicotianae*) [*R.A.M.*, ix, p. 211] were carried out on two acres of land cropped to tobacco for five successive years and thoroughly infested by the fungus. The highly susceptible Connecticut Round Tip variety was used for the check rows and was practically destroyed by the disease. A high degree of resistance was shown by several strains of numbers 301, R, 1, and 94, the first-named being a cross between Big Cuba and Little Cuba, 1 and R crosses between Big Cuba and Connecticut Round Tip, and 94 a cross between 301 and R. Number 301 has been widely grown

on a commercial scale with very satisfactory results, and the remaining crosses proved equally promising on a smaller scale. The two cigarette wrapper strains contracted 100 per cent. infection.

GARNER (W. W.). **Tobacco culture.**—*U.S. Dept. of Agric. Farmers' Bull.* 571, 22 pp., 5 figs., 1930.

This bulletin (which is a revised edition of one published in 1914) contains brief popular notes on the symptoms and control of a number of tobacco diseases occurring in the Connecticut Valley and other parts of the United States, viz., black root rot (*Thielavia basicola*), Granville wilt [*Bacterium solanacearum*], sore shank, mosaic (also known as 'calico' or 'walloon'), frenching, leaf spots (including wildfire [*Bact. tabacum*] and angular leaf spot [*Bact. angulatum*]), potash hunger, and magnesia hunger or sand drown [*R.A.M.*, viii, p. 681].

HOPKINS (J. C. F.). **The preparation of Bordeaux mixture and seasonal notes on Tobacco diseases.**—*Rhodesia Agric. Journ.*, xxvii, 11, pp. 1167–1172, 1930.

The author gives some notes on the diseases which may occur in tobacco seed-beds in Rhodesia, and on the measures for their control, among which seed disinfection is stated to be one of the most effective. The diseases considered include wildfire [*Bacterium tabacum*: *R.A.M.*, x, p. 63], angular spot [*Bact. angulatum*: ibid., x, p. 62], frog eye [*Cercospora nicotianae*: ibid., ix, p. 140], damping-off of seedlings [*Corticium solani* and *Pythium de Baryanum*: ibid., viii, p. 269], mosaic [ibid., ix, p. 138], and pink mould [*Pyronema confluens*: ibid., iv, p. 194]. The causal organism of the last-named disease is stated to have been shown to be incapable of attacking the tobacco plants; its presence, however, is an indication of too heavy watering, and it is frequently a forerunner of damping-off.

Directions are also given for the preparation of home-made Bordeaux mixture, the 4–4–50 formula of which is stated to have been highly satisfactory and not to scorch the tender foliage if applied at the correct time.

GRAVATT (G. F.) & GILL (L. S.). **Chestnut blight.**—*U.S. Dept. of Agric. Bull.* 1641, 18 pp., 13 figs. (1 on cover), 1 map, 1 graph, 1 diag., 1930.

In December, 1929, the incidence of chestnut blight (*Endothia parasitica*) [the symptoms, causal organism, and spread of which in North America are briefly described] in the region of the southern Appalachians was estimated to average 100 per cent. throughout Maryland, in the extreme north-eastern part of West Virginia, and in part of central and north-western Virginia, while south-west Virginia, most of the eastern part of West Virginia, and most of the western edge of North Carolina showed 80 to 99 per cent. of the chestnut trees infected [cf. *R.A.M.*, vii, p. 685; ix, p. 628]. A large percentage of the trees are attacked in North Carolina, Kentucky, and Tennessee, and a few scattered infections

are present in Alabama and Georgia. Blight has also been reported on wild and planted chestnuts at a number of points in Indiana and Michigan. Much of the chestnut growth in Ohio is infected or dead, especially in the east of the State. Nearly all the original chestnut trees have been killed in the Middle Atlantic and New England States, while in the northern parts of New York State and New England many isolated trees at the extreme edge of the distribution area of the species have been killed. The disease is also present in Ontario in Canada [ibid., vi, p. 273].

The most practical means of utilizing much of the chestnut timber lies in the manufacture of chestnut extract [ibid., ix, p. 216]; this industry uses enormous quantities of the wood, including trees and parts of trees otherwise worthless. Even the prolonged standing of dead timber does not affect its utilization for this purpose.

Of the Asiatic strains of chestnuts tested in the United States [ibid., v, p. 706] none is immune, but *Castanea japonica* and *C. mollissima* show considerable resistance. Most of the oriental trees can be saved by the systematic excision of the cankers.

GUINIER (P.). **La maladie des Ormes en France.** [The Elm disease in France.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 8–9, pp. 377–379, 1930.

Dutch elm disease (*Graphium ulmi*) is now widespread in France, where, owing to unsatisfactory conditions of growth, the elms growing by the roadside and along the banks of the canals have suffered most severely. In Lorraine, where the disease has been present only for about six years, nearly all the trees along the high roads and the canal connecting the Maine with the Rhine are either dead or badly affected, the same applying to those growing along the Canal du Midi, in the south-west of France. Elms in the cultivated plains, e.g. around Arles, and in the forests in the great valleys, e.g. near Colmar and in the valley of the Saône, are also dying in large numbers.

GEORGEVITCH (P.). **Die Krankheit der slavonischen Eiche.** [The disease of the Slavonic Oak.]—*Mitt. Inst. Forstwissensch. Forsch.*, Belgrade, pp. 1–31, 3 pl., 1930. (Serbo-Croatian, with German summary.) [Abs. in *Bot. Centralbl.*, N.F., xviii, 1–2, p. 57, 1931.]

The large vessels of the trunks and roots of dying oaks in Jugo-Slavia were found to contain the hyphae, *Graphium*-like bodies, and perithecia of a fungus which was obtained in pure culture on artificial media and on sterilized oak wood blocks and identified as a new species of *Ceratostomella*, to which the name *C. merolinensis* is given. The fungus induces the formation of tyloses and masses of brown gum in the large vessels, leading to their obstruction, with consequent interruption of the transpiration current and of the normal food supply. As a practical silvicultural measure the author recommends the gradual and careful removal of young oaks from infected stands, in order to obviate a sudden excessive thinning of the crown canopy.

MONTEMARTINI (L.). **Est-ce que l'on va vers une immunisation des Chênes contre l'oidium?** [Are we moving towards an immunization of Oaks against *Oidium*?]—Reprinted from *Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, ii, 7, 2 pp., 1930.

After stating that the prevalence and severity of oak mildew [*Microsphaera quercina*: *R.A.M.*, ix, p. 548] appear to have declined progressively since 1915 in northern Lombardy, where trees severely affected fifteen years before showed only slight traces of the disease in October, 1929, and after pointing out that a similar condition is reported to prevail in France, the author briefly describes a test made to obtain confirmation of the view that this is due to gradual immunization.

Six seedlings of *Quercus sessiliflora* from seed of the same tree were exposed for a year to attack by *M. quercina*, which developed on all the leaves, six other seedlings of the same parentage being protected from the disease by frequent dusting with sulphur. The following spring the fungus developed abundantly on the young leaves of five of the six dusted plants, whereas only one of the other group was attacked. Further investigations will be made.

HAHN (G. G.). **Life-history of the species of Phomopsis occurring on conifers. Part I.**—*Trans. Brit. Mycol. Soc.*, xv, 1–2, pp. 32–93, 3 pl., 29 figs., 1930.

This is a detailed account of the author's study in pure culture of a large collection of forms of *Phomopsis* occurring on various conifers in Europe and North America [*R.A.M.*, vi, p. 327; viii, pp. 278, 279], for the purpose of differentiating *P. pseudotsugae* parasitic on the Douglas fir (*Pseudotsuga taxifolia*) [ibid., ix, p. 616] from closely related forms that occur on the same host and on other conifers. The attempt was made to include in the study all the coniferous species of *Phomopsis* at present known, with the possible exception of *P. cryptomeriae* Kitajima & Kamei, a discussion of which is reserved for later publication.

In discussing the present status of the genus *Phomopsis*, which is generally considered to be the imperfect stage of *Diaporthe*, the author states that he provisionally refers certain atypical forms, whose whole life-cycle has not yet been determined, to the group *Phomopsis* (*sensu lato*), although these forms in some of their characters approach the form genus *Fusicoccum*. He differentiates eight coniferous species [the morphological and cultural characters of which are fully described]. These species are: *P. occulta* Trav. which was culturally shown to have *Diaporthe conorum* for its perfect stage (the only species whose complete life-history has been discovered so far); *P. juniperovora* Hahn [ibid., ix, p. 509]; *P. conorum* (Sacc.) Died. (not entering into the life-cycle of *D. conorum*); *P. montanensis* n. sp.; *P. strobi* Syd.; *P. pseudotsugae* Wilson; *P. abietina* (Hart.) Wilson and Hahn; and *P. boycei* n. sp. English and Latin diagnoses of the new species and a dichotomous key are given, and the host range and geographical distribution of the fungi are indicated. *P. montanensis* was found on dead

branches of *Abies lasiocarpa* in Montana in 1927. It has cone-shaped, lenticular, subglobose, or truncate pycnidia, mostly multi-locular and 0·1 to 0·5 by 0·1 to 0·4 mm. in diameter. The A spores are hyaline, unicellular, oblong or ovate, 5·3 to 8·1 by 2·2 to 3·4 μ; the B spores filiform, slightly curved, 9·3 to 11·8 by 0·9 μ. *P. boycei* was obtained on *A. grandis* in Idaho and Montana in 1926–7. The pycnidia are cone-shaped or subglobose, simple or multilocular, 0·1 to 0·5 by 0·1 to 0·4 mm. in diameter. Only A spores were found and were hyaline, unicellular, irregularly fusoid with salient angles so that they become three- or four-sided, rarely elliptical, 9 to 13 by 4 to 7·8 μ in diameter.

It is pointed out that the conifer species of *Phomopsis* exhibited great constancy with regard to cultural characteristics, but that variability among the morphological characters was observed, especially in the characters of the pycnidial stromata. Spore shape and size, on the other hand, were fairly constant and could be relied upon as specific characters. Spores produced in culture showed satisfactory agreement with spores produced in nature. There was some evidence of the existence of physiological strains within the groups of forms studied. The conifer *Phomopsis* species also showed both wide and extremely limited host relationships, e.g., *P. occulta* occurred in North America and Europe on 14 genera, whereas *P. abietina* appeared to be limited to a single host in France and Germany.

WILSON (M.). **The Phomopsis disease of Cedars.**—*Gard. Chron.*, lxxxviii, 2290, pp. 412–413, 4 figs., 1930.

Phomopsis pseudotsugae, the causal organism of die-back and canker of Douglas firs [*Pseudotsuga taxifolia*: see preceding abstract], has recently been found attacking Atlantic cedars (*Cedrus atlantica*) in Hampshire and Scotland, while in the latter region *C. libani* is also affected. In the case of the cedars the fungus causes either die-back or girdling, no cankers having yet been found. The terminal portion of affected shoots may be killed back to a distance of 1 to 2 ft., the dead part being comparatively thin owing partly to the shrinkage of the cortical cells and partly to the absence of secondary thickening due to the death of the cambium. The dead shoots are soon defoliated, and after a time the small, black fructifications of the fungus appear through cracks in the bark; under moist conditions the hyaline spores are discharged in the form of a thin tendril.

Girdling may occur at any place on the branch. The mycelium spreads for a short distance upwards, downwards, and laterally, killing the cortex and ringing the shoot. As in the case of die-back, the dead portion appears to become constricted owing to the cessation of secondary thickening. Defoliation and death of the branches follow the development of the fructifications.

The strain of *P. pseudotsugae* occurring on cedars was shown by cross-inoculations, made through wounds, to be identical with the Douglas fir strain.

P. pseudotsugae is not yet known to occur in America, and the Douglas fir and Japanese larch [*Larix leptolepis*] must therefore have contracted infection since their introduction into Europe.

Silver firs (*Abies pectinata*) and European larches [*L. europaea*] are already known as hosts of the fungus. So far the disease has only been found on cedar trees over 20 years old, but there is no reason to suppose that infection is confined to mature individuals. The spores of *P. pseudotsugae* are air-borne, so that the presence of diseased Douglas firs or Japanese larches in the vicinity of cedars would be a source of danger to the latter. The usual cultural measures are recommended to arrest the spread of the disease.

LIESE (J.). **Erkrankungen der einjährigen Kiefern-Keimpflanzen durch Cenangium abietis im Frühjahr 1930.** [Pathogenicity of *Cenangium abietis* towards one-year-old Pine seedlings in the spring of 1930.]—*Deutsche Forstzeit.*, xlv, pp. 490-491, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxii, 15-22, p. 462, 1930.]

The damp winter of 1929-30 in Germany promoted the growth of *Cenangium abietis* [*R.A.M.*, viii, p. 686, and above. p. 272], which killed up to 50 per cent. of the pine seedling stand in one case. The lower part of the tree often remains healthy and lateral buds are produced from the axils of the green primary needles, giving a bushy appearance. Fungicides are not usually employed in the cleansing of the trees.

PETERSONS (P.). **Priežu skujbires Lophodermium pinastri Chev. apkarošanas mēgīnājumi.** [Spraying Pines against the shedding of needles caused by *Lophodermium pinastri* Chev.] —*Acta Inst. Defens. Plantarum Latviensis*, i, pp. 15-17, 1930. [English summary.]

Lophodermium pinastri, the causal organism of needle fall of pines [*R.A.M.*, ix, p. 499], was well controlled on one- to four-year-old trees in Latvia during 1927 to 1929 by the application of 2 per cent. Bordeaux mixture, 2 per cent. Burgundy mixture, or lime-sulphur 1 : 32, the last-named being the most convenient and economical of the preparations. The best results were obtained by spraying first during the latter part of July or early in August, and secondly in the middle or towards the end of August. One application, however, was sufficient for all practical purposes. Untreated trees on sandy soil showed as many as 100 per cent. killed; in the nurseries the incidence of infection was highest on non-transplanted, one- to three-year-old pines.

KAMEI (S.). **Notes on Milesina vogesiaca Sydow on Polystichum braunii Fée and its peridermial stage on the needles of Abies mayriana Miyabe et Kudo, A. firma Sieb. et Zucc. and A. sachalinensis Mast.**—*Trans. Supporo Nat. Hist. Soc.*, xi, 3, pp. 141-147, 3 figs., 1930. [Japanese summary.]

Details are given of the writer's investigations near Sapporo, Japan, on the genetic relationships of *Milesina vogesiaca* Syd., a common rust on the fern *Polystichum* (*Asplenium*) *braunii*. Inoculation experiments with the teleutospores of the rust on *Abies mayriana*, *A. firma*, and *A. sachalinensis* gave positive results, and the resulting aecidiospores were successfully inocu-

lated into *P. braunii.* The peridermia occurring on the abovementioned species of *Abies* are hypophyllous, white, cylindrical, 0·25 mm. in width, 0·5 mm. in height, ruptured at the apex, with a hyaline peridium of rhomboid or elongated hexagonal cells, 26 to 33 by 14 to 22 μ, the inner wall of which is thick and coarsely verrucose, and the outer thin and smooth. The aecidiospores are globoid to ellipsoidal, 18 to 24 by 14 to 22·5 μ, mostly 21 by 18 μ, with a thin wall (1·5 to 2·5 μ thick). The amphigenous, honey-yellow, later reddish-brown spermogonia are depressed-spherical to subspherical and measure 122 to 177·5 μ in width by 111 to 163 μ in height; the spermatiophores are simple, straight, septate, and obclavate, while the spermatia are oblong, with rounded or truncate ends, smooth, hyaline, and measure 5 to 7 by 1·5 to 2 μ.

MÜNCH (E.). **Zur Kenntnis von Ceratostomella pini, piceae und cana.** [Contribution to the knowledge of *Ceratostomella pini, piceae,* and *cana.*]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz,* xl, 11, pp. 513–516, 1930.

Referring to Zach's alleged detection of *Graphium*-like conidia in cultures of *Ceratostomella pini* [*R.A.M.*, vii, p. 211], the author states that he has examined these cultures and found the organs in question to belong to the genus *Leptographium,* newly created by Lagerberg and his collaborators [ibid., ix, p. 77]. The conidia of the supposed *C. pini* culture differed from those of *L. lundbergii* only in their larger dimensions (10 to 18 by 6 to 8 μ). The conidia, perithecia, and sclerotium-like bodies originally observed by the present writer in his cultures of *C. pini* did not occur in those of Zach, and inoculation experiments with the latter material on pine wood results in the development of blueing accompanied by typical yellow *Leptographium* spore drops. Cultures of *C. pini* freshly isolated by the writer from pine wood agreed in all respects with his earlier ones and differed completely from those of Zach. Conidia and perithecia were formed but no *Leptographium,* and the typical symptoms of infection by *C. pini* were produced on inoculated pine wood.

Zach's statement that *C. cana* is only a variant of *C. piceae* occurring under specially favourable conditions [ibid., viii, p. 345] is also contested. The writer's protracted studies of these organisms in monospore cultures have proved convincingly that they are quite distinct. One striking peculiarity of the *Graphium* spores of *C. cana* is their chalky appearance, visible even to the naked eye. It would seem from Zach's description that he was working with mixed cultures of the two fungi, which may frequently be observed growing together both in nature and on artificial media. The author's views regarding the independence of *C. cana* and *C. piceae* are stated to be fully endorsed by the work of the above-mentioned Swedish investigators.

SALING (W. M.). **The effect of blue stain on the penetration and absorption of preservatives.**—*Proc. Amer. Wood Preservers' Assoc., 1930,* pp. 183–197, 1930.

A full account is given of a series of laboratory experiments to test the effect of blue stain [*Ceratostomella* and *Graphium* spp.;

R.A.M., viii, p. 746; see also x, pp. 71, 143] in wood of *Pinus ponderosa* and *P. taeda* on the absorption and penetration of zinc chloride and creosote, as well as to compare the penetration of the two preservatives into the two woods used. The pieces of wood used measured 14 by 1 by 1 in. and were oven dried before treatment. The preservative was applied by the hot and cold bath method [cf. ibid., vii, p. 212].

When *P. ponderosa* was treated with zinc chloride the medium-stained wood gave 82·4 per cent. average absorption (oven-dry basis) with radial and tangential penetration each averaging 0·38 in. The corresponding averages for the heavily stained wood were 119·7 per cent., 0·39, and 0·44 in., respectively, and for unstained wood 51·1 per cent., 0·20, and 0·11 in., respectively, the absorption per cent. being 2·3 times greater in the heavily stained than in the unstained pieces.

When creosote was used with *P. ponderosa* the clean wood showed an average absorption of 11·7 per cent. and an average penetration of 0·22 in. radially and 0·13 in. tangentially, the corresponding figures for the heavily stained wood being 45·4 per cent., 0·4 in., and 0·45 in., respectively.

In the tests made with *P. taeda* and zinc chloride the clean wood showed 50·6 per cent. average absorption and 0·27 in. and 0·23 in. radial and tangential penetration, as compared with 60·6 per cent., and 0·36 in. and 0·31 in. for the same measurements, respectively, in the heavily stained wood. With creosote the clean wood gave 15·5 per cent. absorption and 0·24 in. and 0·2 in. penetration, respectively, and the stained material 20·5 per cent., 0·34 in., and 0·26 in., respectively.

The results obtained lead the author to conclude that blue stain increases rather than diminishes the absorption and penetration of wood preservatives. The difficulty experienced by previous workers in this respect is attributed to the moisture factor. Zinc chloride is absorbed more readily than creosote while the penetration of the two preservatives is about equal, so that good penetration with creosote is obtained with a smaller amount of preservative.

A bibliography of 19 titles is appended.

RHODES (F. H.) & GARDNER (F. T.). **A laboratory method for comparing the efficiencies of preservatives for structural timber.**—*Proc. Amer. Wood Preservers' Assoc., 1930*, pp. 71–78, 1930.

An account of this work has already been noticed from another source [*R.A.M.*, ix, p. 619].

JOHNSON (DELIA E.). **The relation of the Cabbage maggot and other insects to the spread and development of soft rot of Cruciferae.**—*Phytopath.*, xx, 11, pp. 857–872, 1 fig., 1930.

A close connexion has frequently been observed between injuries to the cabbage plant by the cabbage maggot (*Hylemyia* [*Phorbia*] *brassicae*) and the development of bacterial soft rot (*Bacillus carotovorus*) [cf. *R.A.M.*, viii, p. 426]. An investigation was therefore made in Minnesota of the possibility of the dissemination and inoculation of the soft rot bacteria by the maggot.

The eggs of the insect were found to be free from bacteria internally but contaminated externally with various organisms, often including those of soft rot. Contamination of this sort probably originates from the body of the parent fly, from the soil or from decaying vegetable material. No bacteria were found in the larvae hatched from surface-sterilized eggs, but the insects apparently contracted infection from various external sources, such as the soil, rotting plant material, and contaminated eggshell. Bacteria are further ingested by the insects with their food. Viable bacteria of many types, including *B. carotovorus*, were found in the puparia and also in the intestinal tract and excrement of the adult fly. Overwintering puparia were found to contain the soft rot organism, the viability of which was apparently not impaired by exposure to freezing temperatures. It is evident from these observations that a close association exists between the soft rot pathogen and *P. brassicae* in its entire life-cycle.

Cabbage maggot larvae that had been feeding on decaying cabbage tissue inoculated fresh leaves with soft rot bacteria which reduced them to a rotten mass. The constant lacerations from the maggot prevented the wounded tissue from healing over and so checking the decay. Evidently the larvae of the cabbage maggot and related species may serve as agents in the dissemination and inoculation of the soft rot bacteria. Various insects (cynipids and staphylinids) parasitic on the cabbage maggot were also found to disseminate the same types of bacteria, but they are probably of little importance in this respect.

TENNENT (R. B.). **Club-root in Turnips. Ten years' investigation in Otago and Southland.**—*New Zealand Journ. of Agric.*, xli, 5, pp. 318–325, 2 figs., 1930.

The results of field tests from 1920 to 1930 at Otago and Southland, New Zealand, confirmed the relative resistance to club-root (*Plasmodiophora brassicae*) of Irvine's Green-top Yellow turnip [*R.A.M.*, iv, p. 582], and also indicated that Bangholm Improved Purple-top Herning strain swede is superior in its resistance to this disease to the original Bangholm swede [ibid., vii, pp. 299, 758]. The improved strain further proved to be a heavy cropper with well-shaped roots, and to be palatable to cattle; its use is recommended on soils badly infected with the club-root organism, on which other commercial varieties are likely to fail, and it is thought that the production of certified improved Herning swede seed may eventually prove to be of considerable economic importance.

There was evidence that applications of burnt lime at rates of up to 16 tons per acre, while not completely effective in checking club-root, generally reduced the incidence of the disease after the lapse of two years from the time of application.

FAJARDO (T. G.). **Studies on the properties of the Bean mosaic virus.**—*Phytopath.*, xx, 11, pp. 883–888, 1930.

Continuing his investigations on bean [*Phaseolus vulgaris*] mosaic at Madison, Wisconsin [*R.A.M.*, ix, p. 755], the writer studied

the properties of the virus of this disease and has compared them with the known data regarding the viruses of tobacco, cucumber, and potato crinkle mosaics [ibid., ix, p. 737]. The bean mosaic virus retains its infectiousness *in vitro* for 20 to 24 hours, compared with 24 to 48 hours, 24 hours, and one or more years for the viruses of cucumber, potato crinkle, and tobacco mosaics, respectively. The corresponding periods for the retention of infectiousness in dried tissues are two to three days for bean mosaic, over $1\frac{1}{2}$ years for tobacco mosaic, and less than ten days for cucumber mosaic. Again, the bean mosaic virus gives no infection at dilutions higher than 1 in 1,000, while those of tobacco and cucumber mosaics are still infectious at dilutions of 1 to 10,000. Potato crinkle mosaic virus, on the other hand, produces little infection at dilutions above 1 in 10 [ibid., viii, p. 592]. The bean mosaic virus is relatively sensitive to alcohol, no infection being obtained after treatment with 25 per cent. alcohol for 30 minutes, while the tobacco mosaic virus resists 50 per cent. alcohol for several days and 80 per cent. for up to 30 minutes. The cucumber mosaic virus is inactivated by treatment with 50 per cent. alcohol after one hour. The thermal death point of the bean mosaic virus was found to lie between 44° and 56° C., probably near 46 °, while those of tobacco, cucumber, and potato crinkle mosaics are 90°, 75°, and 43°, respectively. The bean mosaic virus was found to be capable of withstanding higher temperatures (65° to 66°) when in the seed than in expressed juice. It was not killed at temperatures that did not destroy the germinating capacity of the seed. The viability of the bean mosaic virus was apparently unimpaired by freezing. Like the potato crinkle virus, the bean mosaic resisted all attempts to filter it through coarse Berkefeld filters, whereas the tobacco and cucumber mosaics will readily pass through bacterium-proof and medium Berkefeld filters, respectively.

RATHSCHLAG (H.). **Zur Spezialisierung der auf Vicia faba parasitierenden Ascochyta.** [On the specialization of the *Ascochyta* parasitizing *Vicia faba.*]—*Phytopath. Zeitschr.*, ii, 5, pp. 493–501, 4 figs., 1930.

In order to ascertain whether the *Ascochyta* infecting *Vicia faba* is restricted to this host, or whether it belongs to one of the 'types' differentiated by Linford and Sprague [*R.A.M.*, vii, p. 1; ix, p. 273], the author compared cultures of the following organisms: two of *A. pisi* from peas, obtained from Baarn, Holland, and Bonn, Germany, respectively; two of *A. pisi* from *V. faba* [var.] *minor* from Rhineland and Pomerania, respectively; *A. boltshauseri* from bean (*Phaseolus vulgaris*) from Baarn; and *Mycosphaerella pinodes* from peas from Baarn.

V. faba [var.] *minor* was severely injured by *A. pisi* in both the above-mentioned districts of Germany in 1929. The pale, translucent lesions, bordered with reddish-brown rings (black towards the edge), may assume such dimensions as completely to destroy the leaf. The reddish-brown pycnidia are either arranged in a circle in the centre of the lesion or scattered over the necrotic area. The brown, red-bordered spots produced by the fungus on

the stalks turn black and sink deep into the tissue, so that the stalks may break and the plant be killed. The pycnidia are scattered over the diseased area. The lesions on the pods are dark brown with a black edge, often deeply sunken in the later stages, when the pericarp is usually penetrated and the seeds partially or entirely invaded by the fungus. The embryo may be involved and germination greatly reduced or even prevented. Sections of diseased seeds from field crops showed the pycnidia on the inside of the cotyledons. Taken as a whole, these symptoms and the injury caused to the plants correspond to those of the 'dark type' (*M. pinodes*), but the pale centres of the lesions more closely resemble the appearance produced by *A. pisi* [ibid., vii, p. 611].

Inoculation experiments were carried out with the six above-mentioned isolations on peas, *V. faba* [var.] *major*, *V. faba* [var.] *minor*, and beans (*P. vulgaris*). All the fungi except *A. boltshauseri*, which only once produced infection on *P. vulgaris*, attacked each of the hosts used in the tests, infection being uniformly most severe on the host from which the organism was originally isolated. A certain degree of specialization, therefore, must be admitted, though it is by no means strict. In culture the pycnospores of *A. pisi* from peas differed constantly in dimensions from those of the same fungus on *V. faba* (13·9 by 3·2 μ compared with 18·2 by 4·9 μ), but in the cross-inoculation experiments it was noticeable that when *A. pisi* from peas was grown on *Vicia faba* the pycnospores were slightly increased in size on the latter host, while when isolations from the broad bean were grown on peas the spores became appreciably smaller. The pycnospores of *M. pinodes* measured 13·2 by 4 μ and perithecia were formed after 21 days, whereas *A. pisi* never produced perithecia either in culture or on the host.

EINECKE (A.). **Der Wurzelkropf der Zuckerrübe.** [Crown gall of the Sugar Beet.]—*Deutsche Landw. Presse*, lvii, 47, p. 642, 2 figs., 1930.

A brief, popular note is given on the occasional occurrence of crown gall (*Bacterium tumefaciens*) on sugar beets in the Potsdam district (Berlin) [cf. *R.A.M.*, ix, p. 702]. The galls may assume larger dimensions than the beet itself, and the consequent metabolic disturbance is reported to cause stunting and deficiency of sugar. As a rule *Bact. tumefaciens* is found only on isolated plants, but where it affects a large number the diseased beets should be destroyed to prevent the spread of infection.

LABROUSSE (F.). **La maladie des Laitues en Alsace et la Sclerotinia minor Jagger.** [The disease of Lettuces in Alsace and *Sclerotinia minor* Jagger.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 8–9, pp. 369–374, 1 pl., 1930.

In the spring of 1930, lettuces growing under frames in Alsace were attacked by a progressive wilt which killed up to 75 per cent. of the plants; the attacks, to which the Blanche de Selestat variety

was the most susceptible, were severest when cold spells suddenly followed warmer weather.

From affected material examined in April the author isolated a fungus which in culture developed a white, septate mycelium with spherical sclerotia, 1 to 2 mm. in diameter; certain hyphae developed conidiophores measuring 10 to 15 by 4 to 5 μ, and bearing one or more spherical, hyaline, microconidia, 3 to 4 μ in diameter. The fungus was identified as *Sclerotinia minor* [*R.A.M.*, ix, p. 224].

A study of the P_H value of the culture media in which they were growing revealed a physiological distinction between *S. minor* and *S. libertiana* [*S. sclerotiorum*]; in a comparative study of an authentic strain of *S. minor* and the fungus isolated from lettuce, both gave analogous results, lowering the P_H value of the medium from 4·9 to 2·2 [cf. ibid., ix, p. 549], and showing a weak reducing power which slightly attenuated the colour of the indicator.

Inoculations made early in April on the Gatta variety rapidly gave positive results, though later, when the outside temperature had risen to about 25° C., other inoculations on plants of the same age were unsuccessful; this is in accordance with previous experience with the same fungus [cf. ibid., v, p. 270].

The use of resistant varieties offers the best means of control.

SEVERIN (H. H. P.). **Carrot and Parsley yellows transmitted by the six-spotted leafhopper, Cicadula sexnotata (Fall.)**—*Phytopath.*, xx, 11, pp. 920–921, 1930.

Carrot yellows was reported during 1929 by Whetzel, Folsom, and Zundel in New York, Maine, and Pennsylvania, respectively (*Plant Disease Reporter*, xiii, pp. 115, 148, 174, 1929), and was observed by the writer in the same year in the Salinas Valley, California, where parsley was similarly affected.

Experiments showed that non-infective six-spotted leafhoppers (*Cicadula sexnotata*), after feeding on White Belgian and Short White carrots and Hamburg parsley naturally infected with yellows, became infective and transmitted the typical symptoms of the disease to healthy asters and celery [*R.A.M.*, x, p. 82]. After feeding on the infected asters and celery, the leafhoppers transmitted the disease back to healthy white carrots and parsley. Carrot and parsley plants grown from seeds were experimentally infected with yellows by *C. sexnotata* in a viruliferous state. After symptoms of the disease developed, non-infective leafhoppers feeding on the experimentally infected plants became viruliferous and transmitted the disease to healthy asters and celery. Yellows was transmitted from infected asters and celery back to healthy carrots and parsley, and further from diseased to healthy carrots, from parsley to parsley, carrot to parsley, and parsley to carrot. The virus of carrot, parsley, celery, and aster yellows [ibid., ix, p. 261] is thus shown to be identical.

Carrots and parsley infected with yellows showed a marked yellowing of the younger leaves, while the older ones were usually reddened. The former were dwarfed and the petioles sometimes twisted; occasionally a dense growth of adventitious chlorotic shoots was formed at the centre of the crown. The roots were usually dwarfed, with bunched rootlets.

LAUBERT (R.). **Eine seltene Krankheit des Kürbisses.** [An uncommon disease of the Vegetable Marrow.]—*Die Kranke Pflanze*, vii, 11–12, pp. 158–159, 1 pl., 1930.

A vegetable marrow in a garden near Berlin was attacked by *Cladosporium cucumerinum* [the morphological characters of which are very briefly described: *R.A.M.*, vii, p. 6]. The irregularly angular to spherical spots produced by the fungus, measuring 1 to 12 mm. in width, were scabby, sunken, cork-brown, or sooty-black, sometimes exuding a gummy substance, and often so densely set that they coalesced. *C. cucumerinum* appears to be much less common on vegetable marrows than on cucumbers (from which it probably spread), having been recorded only once, from East Prussia, in the official survey reports from 1920–27, while no mention is made of the fungus on this host by Saccardo or Rabenhorst. The disease may be controlled by cultural methods (including the avoidance of excessive moisture and shading) supplemented by dusting with sulphur or spraying with Bordeaux mixture.

WEBER (G. F.). **Cucumber diseases in Florida.**—*Florida Agric. Exper. Stat. Bull.* 208, 48 pp., 37 figs., 1929. [Received February, 1931.]

This is a revised edition of the author's previous account of cucumber diseases in Florida [*R.A.M.*, vi, p. 457].

WEBER (G. F.). **Angular leaf spot and fruit rot of Cucumbers caused by Bacterium lachrymans E.F.S. & Bry.**—*Florida Agric. Exper. Stat. Tech. Bull.* 207, 32 pp., 1 graph, 1929. [Received February, 1931.]

This is an expanded account of the author's studies on the etiology, symptoms, mode of infection and dissemination, and control of angular leaf spot and fruit rot of cucumbers (*Bacterium lacrymans*) in Florida, a preliminary note on which has already been published [*R.A.M.*, vii, p. 423].

Both types of the disease (which were definitely proved to be due to the same organism) were produced under varying environmental conditions and on wounded and unwounded plant parts. All the 36 commercial varieties of cucumbers [which are enumerated] used in the tests became infected, little indication of differences in susceptibility being observed. Angular leaf spot has been found to be transmitted by the seed under Florida conditions. The fruit rot results from the penetration of the epidermis by the bacterium, which then advances to the inner core. Of the infection spots that ultimately cause internal fruit rot, 98 per cent. originate on the flat or concave side and penetrate directly to the placentas, where the parasite spreads rapidly in the spongy tissue lying parallel to the long axis of the fruits.

MITTER (J. H.) & TANDON (R. N.). **A disease of Solanum melongena in Allahabad.**—*Journ. Indian Bot. Soc.*, ix, 4, p. 242, 1930.

Eggplants (*Solanum melongena*) at Bharawadj, Allahabad, were affected, in January, 1930, by general stunting, a green to dull

violet, merging into mud-brown to black, discoloration and shrivelling of the tips of the shoots, browning and withering of the leaves, and reduction in size or complete absence of fruit. Microscopic examination of diseased material failed to reveal any trace of fungi or bacteria, and the cause of the trouble must therefore remain obscure pending further investigation.

THOMPSON (R. C.). **Asparagus culture.**—*U.S. Dept. of Agric. Farmers' Bull.* 1646, 24 pp., 8 figs., 1930.

This bulletin contains (pp. 16–22) a section (originally prepared by J. B. Norton and revised by W. W. Gilbert) on asparagus rust (*Puccinia asparagi*) [*R.A.M.*, viii, p. 294]. The best results in control experiments were obtained in California by two applications of a finely divided sulphur at the rate of 25 to 30 lb. per acre, the first about three weeks after cutting and another a month later. In addition the cultivation of the highly resistant Martha Washington and Mary Washington varieties [ibid., iv, p. 362] is recommended. Wild asparagus plants growing round the borders of the fields and along fences, hedges, and ditches form an important source of infection, carrying the rust over the winter and enabling it to attack adjacent fields in the spring.

TEMPEL (W.). **Starkes Auftreten der Fusskrankheit des Spargels.** [Extensive occurrence of foot rot of Asparagus.]—*Obst- und Gemüsebau*, lxxv, 12, p. 241, 1929.

Asparagus plants in the Dresden district of Germany were severely attacked by *Fusarium culmorum* which caused losses of 60 to 80 per cent. A discoloured zone 10 to 20 cm. in length developed at the base of the shoots and the leaves turned yellow and died. The fusiform conidia of the fungus were found in immense numbers within the stem. The rootstocks were also found to be dying in cases of advanced infection. The fungus is thought to have spread to the asparagus plants from straw or possibly from infected asparagus fragments contained in the manure. In addition to the immediate removal and burning of diseased material and improved cultural measures, the writer advocates the treatment of the infected areas with 0·25 per cent. uspulun.

BRITTON (W. E.). **Regulations concerning the transportation of nursery stock in the United States and Canada.**—*Connecticut Agric. Exper. Stat. Circ.* 71, pp. xxv–liii, 1930.

A brief digest is given of the current regulations governing the transport of nursery stock in the United States and Canada. The information is presented under each State in alphabetical order, and notes are also given on the Federal quarantines and postal regulations relating to nursery stock.

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BORDAS (J.), JOËSSEL (P. H.), & MATHIEU (G.). **Influence du mode d'irrigation sur le développement de l'Oïdium du Melon, dans la région provençale.** [The influence of the mode of irrigation on the development of Melon mildew in the region of Provence.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 8-9, pp. 380-382, 1930.

The mildew of melons caused by *Erysiphe polygoni* [cf. *R.A.M.*, iii, p. 261] is very prevalent and causes heavy losses in Provence. It is thought that the disease could largely be prevented by improved methods of irrigation [which are indicated] designed to prevent excessive moisture in the soil.

REICHWEIN. **Fusskrankheit des Spargels.** [Foot rot of Asparagus.]—*Obst- und Gemüsebau*, lxxvi, 12, p. 202, 1930.

The foot rot of asparagus due to *Fusarium culmorum* previously reported from Dresden [*R.A.M.*, x, p. 288] is stated to occur also in the Gross-Gerau district of Hesse, where the symptoms include a red discoloration of the interior of the stem. The conidia are found mostly on the outside of the stems.

LAMBERT (E. B.). **Two new diseases of cultivated Mushrooms.**—*Phytopath.*, xx, 11, pp. 917-919, 1 fig., 1930.

The so-called 'rose-comb' disease of edible mushrooms in the United States, specimens of which have been received from New York, Pennsylvania, Ohio, and Missouri, is characterized by the formation of wart-like intumescences, deep seams, and superfluous gills over the surface of the pileus. These symptoms are very suggestive of crown gall, but a virulent culture of *Bacterium tumefaciens* failed to produce any ill effects on inoculation into healthy mushrooms. The disease is considered to be probably due to the action of coal-oil fumes or the fumes of oxidation products of materials contained in mineral oil, which was used in some form in the mushroom houses in every case investigated. The trouble ceased when this practice was discontinued.

The truffle disease caused by a fungus belonging to the Tuberales overrunning the beds of the cultivated mushroom and stopping the production of the latter, which has been observed in Ohio, Minnesota, Pennsylvania, New York, and Colorado, caused a loss

of $100,000 to one grower in New York during the past season. The causal organism, apparently a species of *Pseudobalsamia* [described as *P. microspora* n. sp. by Diehl & Lambert in *Mycologia*, xxii, 5, p. 223, 1930], is characterized by yellowish, wrinkled ascocarps, discoid on the surface and subglobose in the compost. Very little is known regarding the life-history and mode of dissemination of this truffle, but the available evidence indicates that it is a widely distributed organism which only becomes prominent in mushroom beds where conditions favour its development.

RAVAZ (L.). **Chronique. Enquête sur le mildiou.** [Current events. Inquiry on mildew.]—*Prog. Agric. et Vitic.*, xciv, 44, pp. 417–424; 45, pp. 441–449; 47, pp. 489–495; 49, p. 542; 51, p. 587, 1930.

The author prefaces this series of papers by the statement that henceforth he will publish from time to time, under the same title and in the same journal, the communications received by him from vine-growers on the results obtained in the control of vine mildew [*Plasmopara viticola*]. Each communication will be followed by a brief summary indicating the conditions that ensured the best results in that particular case, and the whole series will be concluded by a discussion, based on this inquiry, of the relative value of the fungicides, of the apparatus used, and also of the frequency of applications best suited to give effective and economical control of the disease.

LUGAN (J.). **Cuivre et mildiou.** [Copper and mildew.]—*Prog. Agric. et Vitic.*, xciv, 45, pp. 452–453, 1930.

The author's experience with artificial manures for vines prevents his concurrence in Villedieu's view that ammonium nitrate predisposes the vine to mildew [*Plasmopara viticola*: *R.A.M.*, x, p. 156]. This hypothesis was clearly disproved by the results of experiments in 1930, in which vine plots in three different regions of southern France received heavy applications of a fertilizer containing this chemical. In none of the plots was mildew more severe than in control plots, and all yielded appreciably more than the vines of neighbouring growers, which were severely attacked by the disease. Moreover, the author does not consider that luxuriance of foliage is a predisposing factor to mildew, provided that control sprayings are made thoroughly and at the appropriate time.

MANZONI (L.). **Prove con l'anticrittogamico 'Italia'.** [Tests with the fungicide 'Italia'.]—Reprinted from *Ann. Staz. Sper. Vitic. Conegliano*, iii (*1929-1930*), 2, 10 pp., 1 fig., 1930.

Carefully controlled tests of the efficacy of Bordeaux mixture and 'Italia', a proprietary preparation of colloidal aluminium compounds, against downy mildew of the vine [*Plasmopara viticola*] convincingly demonstrated the inferiority of the proprietary article which, in the final experiment, caused almost complete defoliation and also injury to quite 80 per cent. of the berries.

BÈNES (G.). **Le court-noué en 1930.** ['Court-noué' in 1930.]—*Prog. Agric. et Vitic.*, xciv, 45, pp. 453–454, 1930.

Continuing his observations on the court-noué disease of the vine in the south of France [*R.A.M.*, vii, p. 763], the author states that in 1930, following meteorological conditions which favoured an early and vigorous development of the vegetation, the diseased stocks kept under his observation showed a tendency towards recovery. Their shoots grew longer than in former years and, speaking generally, they produced a better crop of grapes; in some varieties, however, the flowers failed completely to set. He also points out that court-noué stocks are more susceptible to mildew [*Plasmopara viticola*] than healthy ones, owing to the fact that such stocks are usually to be found in the dampest parts of the vineyards.

GALLES (P.). **Observations sur le court-noué de la Vigne.** [Observations on 'court-noué' of the Vine.]—*Prog. Agric. et Vitic.*, xcvi, 48, pp. 525–530, 1930.

While acknowledging the extremely complex nature of the court-noué disease of the vine, the real cause of which has not yet been ascertained [*R.A.M.*, ix, p. 761], the author infers from his field observations and experiments that the development of the root system of the stocks at too great a depth may be an important contributory factor in this disease, independently of the nature of the soil and subsoil. He suggests some cultural and manurial measures which, it is thought, may serve to prolong the life of the affected stocks and help them to produce a more or less normal crop.

NEDELTCHEFF (N.). **Sur les causes de la coulure, du millerandage et de l'apyrénie chez les Vignes cultivées.** [On the causes of 'coulure', 'millerandage', and 'apyrenia' in cultivated Vines.]—*Prog. Agric. et Vitic.*, xciv, 44, pp. 425–426, 1930.

This is a brief account of the author's experiments in Bulgaria for the purpose of determining the causes of 'coulure' [failure of the flowers to set: *R.A.M.*, iii, p. 700], 'millerandage' [a phenomenon in which the flowers set, but the resulting fruit fails to attain normal size, although seeds may occasionally form], and of 'apyrenia' [total absence of seeds in the fruit] in cultivated vines. The results indicated that the two first-named troubles are due to the low vitality of the pollen, and may be obviated by cross-pollination with other varieties. Apyrenia is not due, in general, to parthenocarpy, but rather to defects in the ovary.

VIALA (P.) & MARSAIS (P.). **Mycolithes (Lithomyces nidulans, spec. nov.).** [Mycoliths (*Lithomyces nidulans*, spec. nov.).]—Reprinted from *Ann. Inst. Nat. Agron.*, Sér. 2, xxiii, 92 pp., 61 figs., 1 map, 1930.

A description is given of curious formations named mycoliths which occur in the soil of vineyards in Palestine and are produced by the mycelium of an Ascomycete (*Lithomyces nidulans* n.g., n. sp.) which envelops the grains of sand and cements them into rocky

masses sometimes exceeding 1 kg. in weight but averaging 150 to 300 gm. They are reddish or greyish, intersected by a network of whitish mycelium, and so hard that they can only be broken with a hammer. The exposed portions near the surface of the soil develop into a sort of sclerotium which may reach 6 to 7 cm. in diameter, 16 cm. in height, and over 100 gm. in weight. These sclerotia, known to Palestine vintners as 'the vine fungus', are intensely hard (like ebony). Both the mycoliths and sclerotia are readily softened by immersion in water, swelling to three times their original weight and size. On drying they resume their natural consistency.

During the infrequent rainy periods the fungus produces its fruiting bodies, and an eelworm (*Tylenchus mangini* n. sp.), encysted in the mycoliths or at the base of the sclerotia, begins to feed on the mycelium and eventually to destroy the reproductive organs.

The mycoliths are mostly readily seen on the underground stem and roots of the vine, round which they form greyish or reddish cylinders between 2 and 5 cm. in thickness. These develop even more rapidly than the isolated mycoliths and may cover the entire stem and roots in five or six years. The plant is strangled, and under conditions favourable to the fungus neighbouring stocks also become affected; indeed, whole plots of 12-year-old vines along the coast near Jaffa have been slowly destroyed by *L. nidulans*. The fungus occurs only in sandy soils with a plentiful supply of phosphoric acid. It can only be cultured on solid media in subdued light; the optimum temperature for growth appears to be from 25° to 30° C.

The fungus produces conidia, pycnidia, sclerotia, and perithecia, all of which occur in nature. The conidia are borne terminally, are spherical in shape, up to 15 μ in diameter, hyaline, with very granular protoplasm, and are provided with a double wall so that they may possibly be considered as chlamydospores. A multicellular type of conidium, somewhat resembling that of *Alternaria*, was also observed. The pycnidia are mostly spherical, 180 to 350 μ in diameter, and always with an elongated ostiole. The pycnospores are deep fuliginous brown when mature, mostly unicellular, with a double membrane, olive-shaped, somewhat reniform, and measure 10 by 6·5 μ. The spherical perithecia range from 60 to 600 μ in diameter (the mature ones averaging 500 μ) and ascospores are rapidly formed even in the smallest, emerging through a short ostiole, the tip of which bears hyaline or translucent rigid bristles, 40 to 70 μ long. The lemon-shaped, light to dark brown ascospores have a dark outer membrane with a light inner one, measure 20 by 14 μ and are formed centrifugally. The germination of the ascospores is followed by the formation of a mycelial weft which quickly produces oidia. The authors regard the fungus as belonging to a new family, the Lithomycetaceae, intermediate between the Erysiphaceae and the Aspergillaceae, and in some ways slightly analogous with the Tuberaceae.

[Abbreviated versions of this paper appear in *Rev. de Vitic.*, lxxiv, 1906, pp. 25–29; 1907, pp. 41–44; 1908, pp. 58–60; 1909, pp. 72–76; 8 figs., 1 map, 1931, and in *Comptes rendus Acad. d'Agric. de France*, xvi, 29, pp. 964–967, 1930.]

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1929.** [Report on the activities of the Phytopathological Service in the year 1929.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 62, 142 pp., 11 pl., 3 diags., 1 graph, 1930.

This report, prepared on the usual lines [*R.A.M.*, ix, p. 16], contains a number of interesting references, of which the following may be mentioned. *Rhizoctonia* [*Corticium*] *solani* was found on the abnormally thickened roots of oat seedlings in a poorly developed stand and is thought to have been possibly responsible for the weak growth.

A species of *Alternaria*, probably *A. solani* [ibid., x, p. 202] was observed on potato leaves showing dark, target-shaped spots on a yellow ground. The fungus has hitherto caused no appreciable damage in Holland. An unusual case of wart disease [*Synchytrium endobioticum*] was observed, in which the fungus occurred directly on the skin of the potato tuber instead of in the eyes. The disease was newly reported to occur over an area of about 15 hect. The cultivation of susceptible varieties is prohibited in 44 municipalities, mostly in the provinces of Groningen and Drenthe and along the banks of the Maas. The pycnidia of *Phoma solanicola* [ibid., vii, p. 667] were found on the stems of potato plants in a field that had been struck by lightning. The lower leaves were shrivelled and brown, the upper ones small and faded. The stems showed a more or less extensive brown discoloration, sometimes reaching down to the root collar.

Beets growing in excessively alkaline soils suffered considerably from scab (*Bacterium scabiegena*) and heart rot (*P. betae*) [ibid., viii, pp. 6, 217], especially where ammonium sulphate was used as a fertilizer. Investigations have been in progress for some years on a yellow discoloration and mottling of beet leaves which die prematurely: the sugar content of diseased plants is much reduced (4,400 kg. per hect. compared with 6,600 kg.). *Clasterosporium* (*Pleospora*) *putrefaciens* [*Sporodesmium putrefaciens*: ibid., vii, p. 131] was found on the affected leaves, but evidently only in a secondary capacity; while the roots of a number of the diseased plants contained the oogonia of *Pythium mamillatum* [ibid., viii, p. 542], and a species of *Ligniera* was also present in some cases.

The minute, black pycnidia and pink pycnospores of *Ascochyta pinodella* [ibid., vii, p. 611] were found on pea plants with dark, necrotic lesions at the stem base.

Cucumbers in the 'fen' district have been severely injured by a species of *Fusarium*, possibly in association with the so-called 'reclamation' disease [cf. ibid., vii, p. 269].

Phoma sp., *Fusarium* sp., and *Thielavia basicola* [ibid., ix, p. 667] were found on the root system of lupins dying prematurely in the Texel district.

Carrots grown for seed were severely injured by a species of *Phomopsis* with two types of pycnospores, viz., the ordinary fusiform, measuring 8 to 13 by 2 to 4 μ, and uncinulate, very slender stylospores. The hypocotyls showed a brown discoloration and the umbel was more or less destroyed. Promising results were given by the application of 1·5 per cent. Bordeaux mixture.

A single case of the rosette or Bermuda disease of lilies [ibid., viii, p. 283] was recorded. *Galanthus nivalis* and *Freesia* bulbs were infected by *Sclerotium gladioli* [ibid., viii, p. 548], and the former also by *Botrytis galanthina* [ibid., x. p. 274]. Hadley roses were attacked by *Sphaerotheca pannosa*, which was well controlled by sulphur or salicylic acid dissolved in methylated spirits and added to a soap solution. *Mahonia* [*Berberis*] *aquifolium* was found, for the first time, to be infected by *Puccinia mirabilissima* [ibid., x, p. 109]. The root system of larch seedlings was infected by a fungus which may have been either *Corticium solani* or *Moniliopsis klebahni* [ibid., ix, p. 133], probably the former, as well as by *Phytophthora omnivora* [ibid., ix, p. 136]. *Sequoia gigantea* seedlings were killed by a species of *Botrytis*, possibly a strain of *B cinerea*.

Notes are given on the results of experiments in the control of various pests and diseases. and on the outcome of trials with some new disinfectant preparations.

NEUWEILER (E.). **Bericht über die Tätigkeit der eidgenössischen landwirtschaftlichen Versuchsanstalt Oerlikon in den Jahren 1924–1929. IV. Pflanzenschutz.** [Report on the work of the Federal Agricultural Experiment Station Oerlikon during the years 1924–1929. IV. Plant Protection.]—*Landw. Jahrb. der Schweiz*, xliv, 6, pp. 798–808, 1930.

An account is given of the phytopathological researches conducted at the Oerlikon Agricultural Experiment Station from 1924 to 1929 [cf. *R.A.M.*, iv, p. 590]. The results of the investigations have already been published at intervals in *Landw. Jahrb. der Schweiz*, and noticed in this *Review*.

MONTEMARTINI (L.). **Note di fitopatologia.** [Phytopathological notes.]—*Riv. Pat. Veg.*, xx, 9–10, pp. 201–206, 1930.

Near Rome in the winter of 1928 the author observed *Erysiphe graminis* actively producing conidia, in spite of a sharp fall in the temperature occasioned by an unusually heavy snowstorm. Numerous perithecia were seen as early as the following April, but no asci or ascospores were observed, although a number of perithecia were long kept under different conditions of humidity and temperature [cf. *R.A.M.*, x, p. 173]. In view of a statement by Sibilia that he observed conidial formation taking place at the end of August, the author suggests that in Mediterranean countries the species may have become able to overwinter solely in the *Oidium* stage. In three localities in which *E. graminis* was present on wild barley (*Hordeum murinum*), infection spread early in May, after a cold rainy period, to wild oats growing in the vicinity and in one locality to *Bromus*, which became very severely mildewed.

A patch of *H. murinum* near Rome was severely attacked by *E. graminis*, though other Gramineae (*Holcus*, *Avena*, *Setaria*, etc.), growing near or amid the barley, remained unaffected. This condition, first noticed in March, lasted for over three months, when the field was reaped; all attempts to infect the healthy species either by placing pieces of diseased leaves on them or by

spraying them with a suspension of the conidia gave negative results.

In July, 1929, *Sphaerotheca pannosa* devastated the young branches of a recently pruned row of cherry laurels (*Prunus laurocerasus*) growing near Perugia, for a distance of some 20 m., causing deformation and rachitism of the young leaves with contortion of the twigs. The branches were too immature to form rapidly a protective periderm, as was indicated by the fact that sections of young, diseased material showed no reactionary cell division, though this was seen in older, less severely affected leaves. From the type of injury produced and the dimensions of the spores the author considers that the fungus can be referred to Woronichin's *S. pannosa* var. *persicae* [cf. ibid., iii, p. 745].

BAUDYŠ (E.). **Fytopatologické poznámky VI.** [Phytopathological notes VI.]—*Ochrana Rostlin*, x, 4–5, pp. 98–119, 10 figs., 1930. [German summary.]

In this further series of phytopathological notes [*R.A.M.*, x, p. 78] the author states that, following the observation that in Moravia stem rust of cereals (*Puccinia graminis*) is much more severe in the neighbourhood of barberry bushes, he made experiments in the eradication of the latter by means of various substances, since the removal of their entire root system by mechanical means is out of the question in view of the rocky nature of the soil. Kerosene was only effective in killing the bushes when ignited, but this method is too dangerous and was therefore abandoned. Very satisfactory results were obtained with kainit piled up on and around the crown of the bushes in rainy weather, to ensure the penetration of this substance into the soil. When bushes on the top of a rocky ledge were thus treated those immediately below them also perished without treatment. It is pointed out, however, that the complete eradication of the barberry in Moravia must not be expected to solve the stem rust question in that country, since the fungus has been found to overwinter there in the uredospore form and as mycelium in the cereals, and further the infection is, no doubt, brought over every spring from other countries by the winds.

An exceptionally severe outbreak was noted of pear scab (*Fusicladium pirinum*) [*Venturia pirina*], a large proportion of the fruit being so badly infected that large surface cracks developed which were invaded by secondary organisms, in consequence of which the pears rotted on the trees as early as June. The outbreak was chiefly caused by the failure of the growers to treat the trees against scab during the winter and spring. A short list is given of local pear varieties which are relatively resistant to *V. pirina*. In some localities pear trees were also severely attacked by *Gymnosporangium sabinae* [ibid., viii, p. 796; ix, p. 601] which girdled and killed large branches.

Botrytis cinerea continued to be very troublesome in *Pelargonium* cultures, not only under glass but even in garden plots in many localities of Czecho-Slovakia [ibid., x, p. 245]; this fungus also did considerable damage to chilli [*Capsicum annuum*] fruits in the field. A fairly severe outbreak also occurred in 1930 of

Macrosporium tomato [ibid., ix, pp. 228, 400] on tomatoes, a disease which is stated to be usually of very minor importance in Czecho-Slovakia. In one locality a severe seedling blight of cabbage (chiefly red cabbage) and cauliflower was found to have been caused by *Phoma napobrassicae* [*P. lingam*: ibid., ix, p. 755 ; x, p. 151]; the fungus was also found attacking more mature cabbage plants later in the season.

JAKOVLEFF (N. A.). Список хвороб садових і городніх культур району Мліївської Дослідної Станції. [List of diseases of orchard and vegetable crops in the district of the Mleëff Experiment Station.]—*Mleëff Hort. Exper. Stat. Bull.* 44, 13 pp., 1930.

In this paper brief notes are given on the more interesting diseases of cultivated plants observed from 1926 to 1930 in the district of the Horticultural Experiment Station at Mleëff [Ukraine], and listed under the popular names of the hosts. Among others the following may be mentioned. Leaf spot (*Phyllosticta mali*) [*R.A.M.*, vii, p. 426] is very prevalent on apple trees over the whole district. *Ascochyta pirina* Pegl. was recorded for the first time in 1930 on the leaves of Philip apples, and in 1929 *Coniothyrium piricolum* was occasionally found on stored apples. *P. pirina* does not usually cause appreciable damage to pear trees, as it only appears in the latter part of the summer. Equally of minor importance is the leaf spot of plums caused by *Coniothyrium pruni* McAlpine (syn. *C. cerasi* Pass.), and the leaf spot of cherries caused by *P. prunicola* [ibid., ix, p. 532]. In one locality apricots were attacked in 1925 by *A. chlorospora*, which formed on the upper side of the leaves grey spots with a brown margin, and on the lower side uniformly brown spots; the stylospores are spindle-shaped, two-celled with a slight constriction at the septum, and measure 20 by 3·5 μ in diameter. The leaf spot caused by *Septoria ampelina* on vine [ibid., x, p. 77] is fairly common, and another one caused by *P. microspila* Pass. was recorded for the first time in 1928 on the same host.

Among the diseases of vegetable crops may be mentioned *Macrosporium tomato* on tomato [see preceding abstract], *Ascochyta pisi* on peas [ibid., ix, p. 665], *Fusarium vasinfectum* on chilli (*Capsicum annuum*) [ibid., ix, p. 546], *Septoria citrulli* El. et Ev. on watermelon (*Citrullus vulgaris*), and *S. cucurbitacearum* on musk melon (*Cucumis melo*) [ibid., iv, p. 467].

McDONALD (J.). **Annual Report of the Mycologist for 1929.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1929*, pp. 464–479, 1930.

Eleven tests with black rust of wheat (*Puccinia graminis*) from eight districts in Kenya all gave one or other of the two physiologic forms K_1 and K_2 previously reported from this region [*R.A.M.*, viii, p. 632] where, so far as is known, these are the only forms present. Up to date form K_1 has been found twelve times, K_2 ten times, and both together twice. The spores of the two forms differ significantly in their dimensions. In artificial inoculations of

approximately 170 wheat varieties comparatively few were resistant to both forms, although many had appeared to show considerable resistance in the field.

The first coffee crop obtained from seed and the first produced on young shoots after stumping were invariably almost free from the berry disease caused by a strain of *Colletotrichum coffeanum* [ibid., ix, p. 31], even when older coffee in the immediate vicinity was severely affected. The disease is most severe during July and August, after which it declines, thus supporting the view that when the beans pass into the hard stage (about September) some change takes place in them which renders them less susceptible. The immunity of the first crops also supports the supposition that the lack of some essential substance in the berries may predispose them to the condition. One grower claimed that a block which had received lime dressings had remained unaffected while other unlimed coffee of the same age and only a few yards away was appreciably attacked.

A *Botrytis* was found on coffee berries showing symptoms resembling those of berry disease except that the dried pulp of the berries was covered with dirty white excrescences, from which the name 'warty coffee' is applied to the condition. In culture a sclerotial fungus was obtained from diseased berries from four localities, though the berries from one district appeared to show a different strain of the organism. Inoculations in the laboratory with the commoner strain gave positive results.

Maize seed from crops infected, even severely, with *Helminthosporium turcicum* [ibid., viii, p. 639] was invariably free from the fungus. In 1928 seed was taken from apparently resistant plants growing in badly blighted crops, and the year following ear-to-row tests were made in the same locality, using the selected seed in comparison with control rows from unselected ears; the results were outstandingly in favour of the selected seed.

A large proportion of maize seed from different districts carried *Gibberella saubinetii* superficially, even when no trace of infection was visible macroscopically; a *Fusarium* and *Nigrospora sphaerica* also occasionally developed in the cultures, while *N. oryzae* was found on maize kernels [ibid., vi, p. 758].

The *Helminthosporium* previously reported on barley [ibid., viii, p. 633] was identified as *H. teres*.

New records for Kenya during 1929 include *Coniothecium chomatosporum* on apples and pears, *Physalospora* sp. on leaves of New Zealand flax (*Phormium tenax*), *Septoria dianthi* and *Heterosporium echinulatum* on carnation leaves [ibid., vi, pp. 531, 667], and *Woroninella* [*Synchytrium*] *dolichi* on the leaves of *Glycine javanica* [ibid., viii, p. 406].

HANSFORD (C. G.). **Annual Report of Mycologist.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31st December, 1929*, pp. 48–49, 1930.

During the period under review black arm of cotton [*Bacterium malvacearum*: *R.A.M.*, ix, p. 590] was present in the Eastern Province, Uganda, over a much larger area than in the previous year, being widely prevalent in Teso, Lango, and part of Busoga.

For the first time the disease was also present in a serious form in the south of Buganda, where it is severest on light soils.

Dysdercus cotton stainers, when bred in the laboratory on food containing no trace of *Nematospora gossypii* [ibid., viii, p. 756] and transferred to healthy cotton bolls, did not induce internal boll disease but only proliferation of the boll wall tissues. Evidence was also obtained that *N. gossypii* is not common on the external surface of cotton bolls and that it does not generally grow through insect punctures in the wall of the boll unless the insect is already infected. The fungus was not detected on or in the insects. After feeding on a culture of *N. gossypii* adults and the older nymphs can transmit it to healthy bolls, but nymphs in the earlier stages do not appear to be able to do so.

The chief sugar-cane disease in Uganda is still mosaic [loc. cit.]. During 1930, recent importations of P.O.J. 213, 2725, and 2727 were supplied in quantity to the estate affected, and remained resistant or immune.

Streak disease prevails on maize throughout Uganda, but has not been found on sugar-cane. Root rot (*Gibberella saubinetii*) was found, for the first time in Uganda, on maize grown from seed imported from Kenya.

LEEFMANS (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch Oost Indië in 1929.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1929.]—*Meded. Inst. voor Plantenziekten*, 79, 100 pp., 1930.

This report, prepared on similar lines to those of former years [*R.A.M.*, ix, p. 160], contains a number of interesting items, of which the following may be mentioned. Root rot of rice, though still widespread, appears to have generally declined in severity, partly as a result of the application to the soil of double superphosphate. Infection by *Pythium* was again observed on rice crops cultivated under dry conditions at Bodjonegoro (Rembang) [ibid., viii, p. 225].

In the Pasoeroean district of Java large potato tubers of late lifted plants were heavily attacked by rusty spot [ibid., vi, p. 247]. The same disease, together with mosaic and leaf roll, was very prevalent on the east coast of Sumatra. Scab [*Actinomyces scabies*] was much in evidence on potato tubers in Cheribon.

Maize in the Manado Residency was affected by a new disease (probably of fungal origin) in which the contents of the cobs assume a black, papery aspect.

Hevea rubber mildew [*Oidium heveae*] was detected for the first time on the east coast of Sumatra.

Pink d'sease of *Cinchona* (*Corticium salmonicolor*) was prevalent in Java. *Armillaria mellea* and *Rosellinia arcuata* caused increasing damage on the same host in Sumatra [ibid., ix, p. 161].

The top die-back of coffee [ibid., x, p. 240] is stated to be increasing in an alarming manner in Malang, affecting 85 per cent. of the trees in a plantation under observation in the Kloet district. In south Sumatra the disease has been observed on *Coffea robusta*, *C. quillou*, *C. excelsa*, and *C. arabica*. Both in Java and Sumatra a species of *Rhizoctonia* has been found in the wood vessels of

diseased trees. *Corticium salmonicolor* occurred in 24, 71, 78, and 100 per cent., respectively, of the coffee plantations in four different districts of Sumatra. *Hemileia* [*vastatrix*] is practically absent from *Coffea arabica* plantations at high altitudes in the Bali and Lambok Residency (Java).

Owing to the fact that 93 per cent. of the sugar-cane grown under the supervision of the Java Sugar Industry Experiment Station now consists of the sereh-resistant P.O.J. 2878 variety [cf. ibid., vi, p. 639], this disease failed to develop for the first time since 1883 [ibid., vii, p. 308]. Considerable damage was caused by *Cercospora kopkei* [ibid., viii, p. 226] in the sugar-cane plantations throughout Java, the disease evidently being favoured by the wet west monsoon of 1928–9.

Top rot of tobacco occurred in a very severe form in Sumatra, especially on tertiary and subhydric soils [ibid., viii, p. 554]. About 10 per cent. of the Sumatra tobacco seed-beds had to be cleared away on account of slime disease [*Bacterium solanacearum*], which was further responsible for losses of up to 39 per cent. in the field crops.

About 30,000 tea bushes on a plantation of 400 bouws [1 bouw = 0·71 hect.] in the Buitenzorg district of Java were destroyed by the red root fungus (*Ganoderma pseudoferreum*), which is stated to be much more prevalent in West than in East Java. This fungus was also found on the cover crop *Deguelia microphylla* [*Derris dalbergioides*]. *Helicobasidium compactum* attacked *Vigna oligosperma* and *Indigofera endecaphylla* in Malang [ibid., ix, p. 563], where the latter host was also severely injured by *Rosellinia bunodes*. *Crotalaria usaramoensis* sustains such heavy damage from the attacks of *Parodiella spegazzinii* [ibid., v, pp. 254, 652] on the east coast of Sumatra that its replacement by the less susceptible *C. anagyroides* is recommended.

Cabbage on the east coast of Sumatra is liable to infection by *Pseudomonas campestris*.

Citrus in the Madoera Residency (Java) was again seriously injured by 'foam' disease [ibid., ix, p. 160].

Bananas in the Atjeh Residency (Java) were destroyed by what is believed to have been the Panama disease [*Fusarium cubense*: ibid., x, p. 43].

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude d'une nouvelle espèce d'Aspergillus: Aspergillus halophilus.** [Study of a new species of *Aspergillus*: *Aspergillus halophilus*.]—*Ann. Mycol.*, xxviii, 5–6, pp. 362–363, 1 pl., 1930.

Details are given of the morphological and cultural characters of a new species of *Aspergillus*, *A. halophilus*, isolated from a sample of cacao damaged by contact with sea water and subsequently stored under warm conditions [cf. *R.A.M.*, ix, pp. 162–164].

The fungus is characterized by a pale pink mycelium, the hyphae measuring 5 to 7 μ in width, and vesicles, 25 to 35 by 18 to 20 μ, covered with simple or branched sterigmata, 25 by 6 to 7 μ, each bearing a chain of pink, echinulate spores, 5 to 9 μ in diameter. Sterigmata may also be borne singly or in groups of

two to four, either directly or by the interposition of a foot on the hyphae of the aerial mycelium; they measure 20 to 40 by 7 to 13 μ. Penicillioid forms and chlamydospores were also observed. Good growth was made on various standard media, the optimum temperature being 22° to 24° C. and the maximum 34° to 35°.

MELCHERS (L. E.). **Wheat mosaic in Egypt.**—*Science*, N.S., lxxiii, 1882, pp. 95–96, 1931.

During the period from December, 1927, to 1929 the author had opportunities of investigating wheat mosaic [*R.A.M.*, ix, p. 580] in Egypt, a preliminary account of which is given in this paper. The disease, which occurred in a severe form in 1928 and to a lesser extent in 1929 and 1930, is believed to have been present in the country for several years before its detection. At the Giza agricultural farm the standard Hindi variety was found to be particularly susceptible, 40 to 60 per cent. of the plants being badly affected in certain fields, where the reduction of yield was estimated at 20 to 40 per cent. Severely diseased plants were completely yellow in the early stages of growth and at the beginning of tiller formation, and never attained more than a third or a quarter of the normal size, the heads being very small and the grain shrivelled. Completely chlorotic plants seldom showed any additional leaf or sheath symptoms as the season advanced, while in less severe cases yellow stripes ran the entire length of the leaf, or mottled areas of yellow mosaic developed in short or long streaks. The green mosaic type of the disease was rare.

Rosette of wheat and barley, believed by the author to be associated with mosaic, also occur in Egypt, where they have been present, according to members of the Ministry of Agriculture, since 1925. In 1927 the disease was observed by the writer in many provinces. Barley was affected by a striping and yellow mosaic indistinguishable from the rosette occurring on wheat in the United States. The reaction of certain American spring wheat varieties supplied by H. H. McKinney and grown in Egypt indicates that the viruses in the United States and in Egypt are distinct.

SCHILBERSZKY (K.). **Der Berberitzenstrauch und die Schwarzrostfrage.** [The Barberry shrub and the black rust problem.] —*Phytopath. Zeitschr.*, ii, 6, pp. 615–637, 1 diag., 1 graph, 1930.

The investigations of various workers on the rôle of barberries (chiefly *Berberis vulgaris* and *Mahonia* [*B.*] *aquifolium*) in the transmission of black rust of cereals (*Puccinia graminis*) are summarized, and a discussion [accompanied by tables] is given of the author's recent researches (1929–30) on the correlation between environmental and climatic conditions and the occurrence of the disease in Hungary.

Under Hungarian conditions the overwintered uredospores of the rust may sometimes be found on winter cereals (rye) and perennial wild grasses, e.g., *Dactylis glomerata* and *Poa pratensis*, in the very early spring (23rd and 25th March, 1930). Teleutospores may be formed as early as a fortnight after the first appearance of the

uredospores. The teleutospores do not germinate until they have overwintered under natural conditions; those passing the winter on straw in barns or granaries cannot be germinated. As a rule the teleutospores lose their viability in a few months, but when kept in the cold they may retain it for almost a year [cf. *R.A.M.*, ix, p. 365]. During the excessively cold winter of 1928–9 (minimum temperature during February in Hungary $-32°$ C.) the teleutospores remained viable and infected the barberries in the following spring, resulting in a severe epidemic of black rust on the cereals. In places liable to rigorous winter weather late developing uredospores of *P. graminis* may in exceptional cases persist until the spring in a viable condition on manure heaps or the like; protection from the frost may further be given by the snow cover. Spring infections may also arise in Hungary through the agency of uredospores which are not of local origin but are borne by the prevailing south, south-east, and south-west winds from southerly regions, e.g., the Balkans and northern Italy [cf. ibid., viii, p. 364].

Although *P. graminis* is not absolutely dependent on the barberry for its persistence, there can be no doubt, in the writer's opinion, that systematic barberry eradication would have a considerable effect in reducing black rust of cereals.

Burton (G. J. L.). **Annual Report of the Plant Breeder for 1929.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1929*, pp. 480–506, 1930.

During 1929 very little black rust [*Puccinia graminis*] was present on wheat of the Njoro Plant Breeding Station, Kenya, [*R.A.M.*, viii, p. 638] even among the susceptible varieties grown as testers, some of which are susceptible to both the Kenya physiologic forms [see above, p. 296] and the remainder to one or other form only.

It is just as important at high altitudes as it is elsewhere to use wheats resistant to *P. graminis*, and they must also resist yellow rust [*P. glumarum*]. Amongst those tested at Mau Summit (8,500 ft.) were 121 F_2 families sent from Cambridge, where they had been bred for resistance to yellow rust; these all proved very susceptible to black rust. All the new Njoro wheats considered as resistant to black rust remained so at Mau Summit, but most of them proved to be too susceptible to yellow rust to be of use at high elevations. A few of them showed only slight ear attacks with this rust, although one of these became heavily infected on an exposed ridge at about 9,000 ft., which indicates that Mau Summit Station is not always a sufficiently exacting test for resistance. None of the 77 wheats bred at the Scott Agricultural Laboratories Plant Breeding Station was sufficiently resistant to yellow rust at Mau Summit to be of use there. Eleven types of Australian Florence wheat grown at Mau Summit were immune from *P. glumarum*, but all except one were severely attacked by *P. graminis*. The following durums were susceptible to both rusts: Beliss, Acme, Kahla, Nodak, Kubanka, Pentad, Bontaar, and Golden Ball.

The new variety B. 286 [ibid., viii, p. 639] is highly resistant to

both physiologic forms of *P. graminis*, while Kenya Governor is highly resistant to one and moderately susceptible to the other. B. 286, though more resistant to *P. glumarum* than Kenya Governor, is not sufficiently resistant for altitudes of 8,000 ft. and over; it will in future be known as 'Kenya Standard'.

HUMPHREY (H. B.) & CROMWELL (R. O.). **Stripe rust, Puccinia glumarum, on Wheat in Argentina.**—*Phytopath.*, xx, 12, pp. 981–986, 1930.

Stripe rust of wheat (*Puccinia glumarum*) was first observed with certainty in Argentina in October, 1929 [*R.A.M.*, x, p. 88], though it is believed to have been present in 1926. The disease occurred in a severe form over an area of some 40,000 square miles. In the Tres Arroyos territory there were two optimum periods for the development of the fungus, infection first taking place on the lower leaves during the boot-to-blossom stage of the host, while the remaining leaves were not killed until the milk stage of kernel development; this final attack was also severe on the glumes, awns, and kernels of susceptible varieties.

A study of the meteorological data for 1928–9 shows that the October rainfall was 75 mm. in excess of the normal, while the temperature was also favourable to the development of the epidemic which occurred towards the end of October and early November. There was also a sufficient rainfall in Tres Arroyos during the autumn (late April, May, and June) and early spring (end of August and September) to promote the growth of the fungus [ibid., iii, p. 130].

In consequence of the 'better seed' campaign, more lots of seed wheat have probably been imported into Argentina since 1925 than at any time for the last three decades. It is possible, therefore, if not probable, that the sporadic outbreak of rust described above may have originated through spores introduced with shipments of wheat from Europe. Hungerford has shown [loc. cit.] that the viability of *P. glumarum* uredospores is retained for two to three months under normal conditions, while Johanna Becker found (*Kühn Arch.*, xix, p. 353, 1928) that they are germinable in the refrigerator after 430 days.

REICHERT (I.). **The susceptibility of American Wheat varieties resistant to Tilletia tritici.**—*Phytopath.*, xx, 12, pp. 973–980, 1930.

A detailed account, accompanied by tables, is given of experiments carried out at Tel Aviv, Palestine, to determine the pathogenicity of nine bunt (*Tilletia tritici*) [*T. caries*] collections towards the Ridit, Hussar, Martin, and White Odessa wheat varieties [cf. *R.A.M.*, ix, p. 515].

On the whole, the results confirmed those obtained by Roemer at Halle, Germany (*Kühn Arch.*, xix, p. 1, 1928) [cf. ibid., vii, p. 775]. The Cosel and Breslau collections proved to be the most virulent and those of Wageningen (Holland) and Zürich (Switzerland) the weakest. The Landeskrona (Sweden) collection showed a slight reduction of virulence in Palestine as compared with Germany, while the Welsh collection lost its infective capacity for

Ridit, Hussar, and White Odessa in Palestine as it did at Brooklyn (United States) [ibid., vii, p. 370]. Scarcely any difference in reaction to the various collections of bunt was observed in the different stocks of the wheat varieties grown in Palestine. Six different strains of bunt were distinguished in the collections used on the basis of their behaviour towards the four wheat varieties.

The modifications in the virulence of bunt of certain collections in other countries are tentatively attributed to the altered climatic conditions, which may inhibit the germination of the more virulent components of the strain while favouring that of the less virulent ones.

Traitement des semences de céréales contre le charbon par le paraformaldéhyde. [Seed treatment of cereals against smut with paraformaldehyde.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 10, p. 395, 1930.

A communication from Jaczewski reports that excellent control of cereal smuts has followed seed disinfection with a mixture of 7 parts by weight of paraformaldehyde in 95 parts of talc, applied at the rate of 420 gm. per 100 kg. of seed. Whereas untreated oats, naturally and artificially infected, developed, respectively, 0·6 and 15 per cent. infection, oats artificially infected with the spores of *Ustilago* [? *avenae*] and treated with the mixture gave a perfectly clean crop, while wheat seed-grain artificially infected with *Tilletia tritici* [*T. caries*] and similarly dusted also gave a completely unaffected crop, though without the treatment approximately 50 per cent. infection resulted. Spores of *Ustilago*, *Urocystis*, and *Tilletia* spp. failed to germinate when treated with paraformaldehyde.

ARNAUD (G.) & GAUDINEAU (Mlle M.). **Le traitement de la carie du Blé (1929–1930).** [The treatment of Wheat bunt (1929–1930).]—*Comptes rendus Acad. d'Agric. de France*, xvi, 31, pp. 1029–1035, 1930.

In this paper (which is preceded by an explanatory note by E. Roux on pp. 1027–1028), the writers give an account of their continued investigations on the treatment of wheat bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, ix, p. 637] in France.

The incidence of infection on the susceptible Bon Fermier variety was reduced from 53·05 per cent. to nil by 20 minutes' immersion in 0·25 per cent. formol and by one hour in 0·25 per cent. G (an organomercuric preparation) or in a mixture of copper fluosilicate and bichloride of mercury (0·1 and 0·02 per cent.). Almost equally good results were given by caseinated Bordeaux mixture (2 per cent. copper sulphate, one hour's immersion), which reduced infection to 0·01 per cent., while the corresponding figures for dusting with cupric chloride, copper oxychloride (2 gm. per kg. seed-grain), immersion for one hour in 0·5 per cent. copper sulphate (followed by dusting with lime) or in 0·5 per cent. copper fluosilicate were 0·05, 0·25, 0·48, and 0·93 per cent., respectively. Good results were also obtained by simply washing the seed (up to 10 times with a total duration of 100 seconds) in water, a process which may prove a valuable adjunct to the liquid disinfectants.

As in the previous experiments, the Red Hussar and Martin Amber varieties remained immune and Ridit virtually so; Polish wheat [*Triticum polonicum*] and Ardito were somewhat more susceptible than in the former test.

EATON (F. M.). **The effect of boron on powdery mildew and spot blotch of Barley.**—*Phytopath.*, xx, 12, pp. 967–972, 1 fig., 1930.

California common barley grown both in the summer and in the winter out-of-doors in a quartz sand bed did not develop spot blotch (*Helminthosporium sativum*) [*R.A.M.*, ix, p. 545] when boron was omitted from the nutrient solution with which the bed was daily flooded. In the summer planting (22nd May) the amount of spot blotch was successively increased by 5, 10, and 15 p.p.m. of boron, while in the winter planting (4th October) the severity of the disease was about the same in these and the 25 p.p.m. concentrations.

In the summer barley planting, powdery mildew (*Erysiphe graminis*) [see above, p. 294] was abundant on plants without boron and absent where this was supplied. In the winter planting some mildew was present under all the treatments, being abundant on plants without boron and present on only two leaves of 100 culms grown with 25 p.p.m. No mildew developed on summer wheat, but it was moderately and uniformly prevalent on all winter wheat cultures, even those receiving boron.

HANNA (W. F.) & POPP (W.). **Relationship of the Oat smuts.**—*Nature*, cxxvi, 3187, pp. 843–844, 1930.

During the past year the writers have been engaged on an experimental investigation of the relationship between the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]). Spores of both fungi were germinated singly in hanging drops and their sporidia removed singly and cultured separately on artificial media. Young oat seedlings were inoculated with (1) monosporidial cultures of *U. avenae* used singly and in pairs; (2) monosporidial cultures of *U. kolleri* used in the same way; and (3) pairs of cultures, each made by mixing a monosporidial culture of *U. avenae* with one of *U. kolleri*.

The seedlings were grown to maturity in the greenhouse, and it was found that plants inoculated with a single monosporidial culture of either smut did not produce diseased heads. Plants inoculated with two monosporidial cultures of opposite sex produced smutted heads. If the two cultures were of *U. avenae* the heads were 'loose' in appearance and their spores echinulate; if of *U. kolleri* the heads showed the covered type of infection and the spores were smooth; if the cultures were mixed the infected heads were of somewhat variable appearance, but on close examination proved to be of the 'loose' type with echinulate spores. The sporidia of both smuts are of two kinds, (+) and (−); those of one species mate readily with sexually opposite sporidia of the other.

These results are considered to indicate that *U. avenae* and *U. kolleri* are genetically distinct with regard to their differential

characters, but the ease with which they can be crossed suggests a close relationship.

STOUT (G. L.). **New fungi found on the Indian Corn plant in Illinois.**—*Mycologia*, xxii, 6, pp. 271–287, 1 pl., 1930.

English diagnoses (accompanied by brief notes) are given of sixteen species of fungi considered to be new to science, which were found on maize in Illinois in 1926 and 1927. Fourteen of these, namely, *Ascochyta maydis*, *A. zeae*, *Coniothyrium zeae*, *Leptosphaeria maydis*, *L. variiseptata*, *L. zeae*, *Leptothyrium zeae*, *Mycosphaerella zeicola*, *Phyllosticta zeae*, *Physalospora zeae*, *Pleosphaerulina zeicola*, *Septoria zeae*, *S. zeicola*, and *S. zeina*, were associated with leaf spots; although their pathogenicity has not been tested, they are believed to be responsible for the lesions with which they were associated.

Of the other two (both of which are caulicolous) *Helminthosporium zeicola* gives some indications of being parasitic; although this organism appears closely to fit the *Helminthosporium* stage of *Ophiobolus heterostrophus* [*R.A.M.*, x, p. 233], the author hesitates to refer it to the latter in the absence of any perfect stage. The parasitism of the second, namely, *Phaeocytosporella zeae* n. gen., n.sp., is doubtful.

None of the fungi enumerated above appears to be of any considerable economic importance as a plant pathogen.

HULL (KATHLEEN L.). **Studies in resistance and susceptibility of Zea mays L. to Puccinia sorghi Schw. physiologic form I.** —*Abstracts of Theses, Univ. of Chicago, Sci. Ser.*, vii (*1928–1929*), pp. 317–320, 1931.

Two types of resistance to *Puccinia sorghi* [*P. maydis*: *R.A.M.*, viii, p. 293], physiologic form I, have been found to be manifested by resistant strains of Golden Glow maize, viz., morphological and physiological, the latter being the more important. Susceptible strains of the same variety were found to have many more stomata per unit area on the adaxial leaf surface than resistant ones. However, since the superficial growth of germ-tubes is sufficient in both groups to reach several stomata, this difference is not considered to be of great importance.

A more important part is played by the second morphological difference between the two groups, namely, the size of the stomata and their openings, due to differences in the length of the guard cells. It has been suggested that the development of appressoria in rusts may depend on the quantity of water vapour emitted through the stomatal opening. Appressoria are formed over the first stoma encountered by the germ-tube on the susceptible host at any time during the day (according to the time of inoculation), whether it is open or closed. In the resistant host, on the other hand, the germ-tubes generally pass over several stomata before their contents round up, and very often no appressoria are developed.

The guard cells in the infected stomata of the susceptible hosts show a decided difference in their reaction to stains at the point of contact of the germ-tube, while in resistant strains of maize

this alteration, if present at all, is so slight as to be readily overlooked. No change appears to occur in the contents of the guard cells, the action being evidently of an enzymatic nature and possibly facilitating the entry of the germ-tube. Once within the stoma the germ-tube develops in both resistant and susceptible hosts into a triangular substomatal vesicle, generally smaller in the former than in the latter. With the formation of primary hyphae by the small vesicles comes the first direct indication of antagonism between host and fungus. The host cells become plasmolysed, thick-walled, and finally die, while the parasite is repelled, undergoes plasmolysis, and also dies. It is not clear whether the reaction of the host is due to the presence of substances secreted by the fungus, or if the latter is repelled and killed by toxins from the host cells. Usually the reaction is simultaneous in both tissues, otherwise the host is the first to show any change. No haustoria are formed in cases of such marked antagonism. Where large substomatal vesicles are formed in the resistant host, the fungus is able to proceed with its life-cycle up to the period of sporulation. Growth is more rapid than in the susceptible host, and haustorial contacts are made with the host cells before the latter have time to establish any antagonistic response. Once this contact is complete there is a perfect equilibrium between host and fungus, and henceforth the formation of haustoria produces no noticeable reaction in the host cells. The haustoria are smaller and less numerous in the resistant than in the susceptible host, and the vegetative growth of the parasite is much less extensive and does not last so long, sporulation beginning at least a day earlier than in susceptible strains. This indication of an uncongenial relationship is confirmed by the limited hyphal massing previous to sporulation in the resistant host; the hyphae are large, apparently drained of their contents, and very loosely matted together. The failure of the majority of uredosori in resistant plants to rupture the epidermis seems to be directly due to the poor massing of the underlying hyphae. Possibly the weak growth of the parasite in such cases is due to starvation, since the protoplasm of the resistant host does not permit the same vigorous development as occurs in the susceptible strains. A very limited number of mature uredospores are formed by *P. maydis* in a resistant host.

EVANS (M. M.) & HARRAR (G.). **Germination of the oospores of Sclerospora graminicola.**—*Phytopath.*, xx, 12, pp. 993–997, 2 figs., 1930.

After repeated trials the writers succeeded, in December, 1928, in securing the germination of the oospores of *Sclerospora graminicola* [*R.A.M.*, x, p. 181] from infected *Setaria viridis* plants. The oospores were shaken from the tissues into a beaker of sterile distilled water and most of them rose to the surface; from 5 to 30 per cent. germinated in 24 hours at room temperature. Where clean diseased tissue was not available the oospores were surface-disinfected in 5 per cent. lactic acid, washed in sterile distilled water, and floated on sterile water in watch glasses at 18°. After 24 hours the spores began to emit hyaline, branched germ-tubes

which measured 600 to 700 μ in length after 30 hours, with a breadth of about 5 μ. Good germination was obtained on agar, malt, potato dextrose, maize seedling agar, bouillon, and soil agar. Neither aerial hyphae nor conidia were observed to form from the germ-tubes.

REICHERT (I.) & FAWCETT (H. S.). **Citrus diseases new to Palestine.**—*Phytopath.*, xx, 12, p. 1003, 1930.

The following diseases of citrus were observed for the first time in Palestine on a recent tour of inspection. Exanthema [*R.A.M.*, x, p. 24] was found on orange trees on sandy soil in an orchard near the sea. The 'stag-horn' and curved appearance of the branches, shortened nodes, multiple buds, and stained terminals were typical of the disease, but the gum pockets usually associated with the condition elsewhere were absent.

Twig blight (*Sclerotinia sclerotiorum*) [ibid., ix, p. 302; x, p. 24] was found on a few lemon trees. Hitherto this disease has been of no economic importance in Palestine, but its recent detection on bananas in the Jaffa district [ibid., x, p. 117] and experimental transmission to oranges suggests its probable occurrence on the latter in nature.

Mal secco [*Deuterophoma tracheiphila*: ibid., x, p. 182] was found on lemon, sour orange [*Citrus aurantium* or *C. bigaradia*], citron [*C. medica*], and possibly sweet lemon, in two orchards. The dying-back of the twigs and the pink discoloration of the wood occurring at considerable distances from the infected bark and dead ends of the twigs resembled the symptoms of the disease in Sicily.

Psorosis [ibid., x, p. 161] was definitely identified only in one orchard on Valencia trees, though what appeared to be the same disease also occurred in a few old orange groves.

REICHERT (I.). **Diseases, new to Citrus, found in Palestine.**—*Phytopath.*, xx, 12, pp. 999–1002, 1 fig., 1930.

During 1928 and 1929 some new and very serious citrus diseases were observed in Palestine. Little leaf [*R.A.M.*, ix, p. 645], which affected young orange and grapefruit trees budded in the autumn of 1927, is characterized by stunted branches, shortened joints, and abnormally small leaves, sometimes mottled and often as if burnt at the tips. The new branches, instead of bending downwards, remained upright and formed a bushy growth. This disturbance appears to be of a physiological nature, associated with the evaporation of soil moisture and the heavy loss of water from the young trees after cutting back consequent on the low rainfall and long hot spells of 1928. Another contributory factor may have been the loss of calcium in the terminal parts of the trees during the hot weather due to the cutting back of the stock and pinching back of the young trees.

In May, 1928, the western side of non-budded, one-year-old sweet lemon seedlings showed yellow, sunken spots which finally girdled the whole stem 10 to 20 cm. above the collar. The branches turned yellow and withered, and eventually the whole

crown died. The affected wood behind the spot was grey and the surface of the cortex bore the spores of an *Alternaria*, while the wood vessels were invaded by a mycelium. Similar spots were observed on young trees budded in the previous autumn, but no girdling occurred in this case and the necrotic discoloration only extended half way up the stem. This form of the disease caused particularly severe damage. A parasite appears to be implicated in the causation of this trouble, but climatic factors, e.g., sun, wind, and marine humidity on the western side, probably also play a part.

Twelve per cent. of the budded trees in a young orange orchard were found, in April, 1929, to be suffering from dying-back of the stock stubs. The affected part turned brown and the disease spread downwards. When the bud was reached the crown began to wither and die back. The wood vessels of the necrotic area were filled with mycelium. In 1930 brown, necrotic spots appeared in the inner bark and wood close under the scion of two-year-old trees, which invariably presented a stunted appearance. The brownish wood tissue was filled with hyphae, as in the case of the dying-back of stock stubs, of which the present manifestation is believed to be a later stage.

Stem rot of oranges is characterized by the cracking and peeling of the cortex and the discoloration of the underlying wood. Underneath the cortex and on the surface of the wood of the stem numerous sclerotia of *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., viii, p. 500] were found, but it is not yet certain whether the fungus is the primary cause of the trouble. In any case, the Palestine strain belongs to the C group (sclerotia about 100 μ in diameter), and is therefore not identical with that occurring on oranges in Rhodesia, which is of the A type. The rot can be traced down to the roots, where infection seems to originate.

FAWCETT (H. S.). **Brown rot of Citrus in Mediterranean countries identical with that here.**—*California Citrograph*, xvi, 2, p. 81, 1930.

Brown rot of the fruits and gummosis of the stem of citrus [cf. *R.A.M.*, ix, p. 645], either together or separately, were observed by the author to be widely distributed throughout the Mediterranean basin, and cultures isolated from fruits by the author from Spain, Sicily, and Egypt were found by him and by S. F. Ashby to be referable to *Phytophthora citrophthora* as isolated in California. Similar results were obtained from the examination of cultures isolated by Reichert in Palestine, and by Sirag-el-Din in Egypt, from the bark tissues of trees affected by gummosis. In November, 1929, following rain, brown rot of oranges and lemons (mostly on fruits near the ground) and gummosis were prevalent in all the districts round Valencia, in Spain, severe gummosis being present in one lemon orchard on fairly heavy ground. Gummosis-like lesions were seen in north and south Italy, Tunis, Algeria, Egypt (where brown rot was also observed), and Sicily; in the last-named region much brown rot was present during wet weather in winter on lemon fruits, above the ordinary water splash from the soil, as

well as on leaves near the ground. In Palestine gummosis was common but under control.

FISHLOCK (W. C.). **Moisture and mould in Copra under Western Province conditions.**—*Gold Coast Dept. of Agric. Year Book 1929* (*Bull.* 22), pp. 233–238, 1930.

When separate lots of carefully dried copra having an average moisture content of 5·87 per cent. were stored at Nzima, Gold Coast, the time taken for 100 per cent. mould to develop ranged from 36 to 187 days, the mould on every lot being of the harmless grey-green type due to *Penicillium* spp. which do not cause the production of free fatty acids from the oils. Most of the lots increased in weight during storage, as a result of absorbing moisture from the air, particularly during the wet months of June and July, but under the conditions of the experiment this was not sufficient to allow of the development of the harmful brown and black moulds (*Aspergillus* spp.) [*R.A.M.*, ix, p. 177] which only occur on copra containing at least 7 or 8 per cent. of moisture.

It is concluded that under the local conditions copra with not more than ·6 per cent. moisture content can safely be stored for long periods. For plantation purposes it may be accepted that stored copra will not be attacked by harmful moulds if its weight at the time of storing does not exceed 58 per cent. of the weight of the original fresh kernel.

THOMPSON (A.). **A note on thread blight of Coffee.**—*Malayan Agric. Journ.*, xviii, 12, p. 621, 1930.

In August, 1930, thread blight of coffee was reported for the first time in Malaya, where the condition was due to a fungus belonging to the marasmioid group [*R.A.M.*, iv, p. 66] with anchor cells, and thus resembling the organism causing the same disease in the Dutch East Indies [ibid., viii, p. 776] but differing from that responsible for thread blight of *Hevea* rubber in Malaya. The disease, it is considered, is unlikely to prove serious.

LINDEGG (GIOVANNA). **Marciume del colletto di piantine di Cotone appena germinanti.** [Collar rot of newly germinating Cotton seedlings.]—*Riv. Pat. Veg.*, xx, 1–2, pp. 9–17, 4 figs., 1930.

A description is given of a collar rot of young cotton seedlings growing in a bed in which tomatoes a few weeks previously had been killed off by a closely similar condition. The root and part of the hypocotylar axis were rotted, discoloured, and flaccid; the cotyledons became yellow and soft and curled at the margins, and the seedlings rapidly withered and died. In advanced stages the stems easily broke at the collar.

Infected material showed the presence of a hyaline, branched, septate mycelium with very numerous hyaline, fusiform, straight or falcate, 0- to 5-septate conidia (a few of which were swollen between the septa) containing large refracting oil drops and measuring 8·4 to 16·8 μ in length for the smaller 1- to 2-septate conidia while the 3- to 5-septate ones measured 16·8 to 40·8 by 3·6 to 6 μ. The fungus was identified as *Fusarium vasinfectum*.

The disease, which is attributed to unsuitable cultural and soil conditions, was successfully controlled by removing the affected plants, thinning out the remainder, and applying to the soil powdered iron sulphate and quicklime mixed in equal parts.

JENNISON (M. W.). **Detection of fungus mycelium in mildewed Cotton fabrics.**—*Science*, N.S., lxxii, 1866, pp. 346–347, 1930.

Satisfactory differential staining of mildewed cotton fabrics for the determination of the presence or extent of fungus mycelium has been obtained with the Pianese III b stain, consisting of martius yellow, malachite green, and acid fuchsin. The material for examination is washed in water or alcohol (preferably the latter), stained for 15 to 45 minutes, washed in water, decolorized in acid-alcohol, and dried before mounting in Canada balsam or the like. The cotton fibres stain green and the fungus mycelium a deep pink. The method is equally applicable to raw cotton and undyed yarns and fabrics, and will usually serve also for dyed material.

ROUBAUD (E.) & TOUMANOFF (C.). **Essais d'infection expérimentale de larves de Culicides par quelques champignons entomophytes.** [Attempts at the experimental infection of the larvae of Culicidae by some entomophytic fungi.]—*Bull. Soc. Path. Exot.*, xxiii, 10, pp. 1025–1027, 1 fig., 1930.

Spore suspensions of *Beauveria bassiana* [*R.A.M.*, x, p. 188] and *B. globulifera* [ibid., vi, p. 610] caused the death of a considerable proportion of the larvae of *Culex pipiens* and *Anopheles maculipennis* into which they were inoculated at 20° C. [cf. ibid., ix, p. 109]. Considering that a certain number of the insects escaped infection even under the severe conditions of the tests, it is scarcely probable that this method can be widely applied for the extermination of the pests in nature.

DE ALMEIDA (F. P.). **Différences entre l'agent étiologique du granulome coccidioïdique des États-Unis et celui du Brésil. Nouveau genre pour le champignon brésilien.** [Differences between the etiological agents of coccidioidal granuloma in the United States and Brazil. New genus for the Brazilian fungus.]—*Comptes rendus Soc. de Biol.*, cv, 29, pp. 315–316, 1930.

Striking morphological and pathogenic differences having been observed between the causal organism of coccidioidal granuloma in the United States (*Coccidioides immitis*) and that responsible for an analogous condition in Brazil, the author has created a new genus for the latter, *Paracoccidioides*, with the type species *P. brasiliensis* [cf. *R.A.M.*, ix, p. 652]. The fungus occurs in the diseased tissues in the form of spherical bodies with a double contour, 1 to 40 μ in diameter; reproduction is effected by multiple budding. On Sabouraud's medium the cultures are white, resembling the pleomorphic forms of the dermatophytes; in bouillon and plain agar (P_H 7·4) the above-mentioned spherical bodies are abundant. The principal sites of natural infection in man are the mouth and the lympho-adenoid system, the bones and lungs being rarely affected.

SANGIORGI (G.). **Sulla patogenicità della 'Blastocystis hominis'.** [On the pathogenicity of *Blastocystis hominis*.]—*Pathologica*, xxii, 462, pp. 173–176, 1930.

The author's wide experience of blastocystosis, acquired in Albania during the world-war, has convinced him of the virulent pathogenicity of the causal organism, *Blastocystis hominis* [*R.A.M.*, ix, p. 525]. The vegetative growth of the fungus occurs during the sub-acute or chronic stage of the disease, characterized by severe intestinal disturbances, the spores being formed during the succeeding post-critical phases. The resistance of the parasite is such that no effective therapeutic measures have yet been devised.

HIRANO (C.). **A study on thrush.**—*Japanese Journ. Exper. Med.*, viii, 5, pp. 495–498, 1930.

The causal organism of thrush (*Oidium* [*Candida*] *albicans*) is stated to be very prevalent in Japan. When the fungus is grown on 2 per cent. glucose bouillon the medium always becomes acid, regardless of its original hydrogen-ion concentration, the maximum hydrogen-ion concentration being reached within 24 hours. This increase of acidity does not, however, cause the death of the fungus. The sugar in the medium decreases in proportion to the growth of *C. albicans*.

The fungus was found to be toxic when administered orally to very young animals (especially rabbits) and was readily recovered from the diseased organs. Agglutination and injection experiments [details of which are given] demonstrated the presence of a soluble antigen in the thrush fungus. The death of experimental animals was caused by the intravenous injection of the washing or dialysate of the fungus, the toxic substance of which was found to belong to the amino group.

MACLEOD (J. M. H.). **Skin-diseases due to Monilia and other yeast-like fungi.**—*Brit. Journ. of Dermatology*, xlii, 12, pp. 549–561, 8 figs., 1930.

An account is given of the author's work at St. John's Hospital for Skin Diseases during the last two years on the cutaneous lesions caused by *Monilia* and *Pityrosporon* [*R.A.M.*, ix, p. 780].

Of the more than 20 forms of *Monilia* differentiated by Castellani [ibid., viii, p. 444], only two have been definitely distinguished in these studies, viz., *M.* [*Candida*] *albicans* [see preceding abstract] and *M.* [*C.*] *pinoyi*. The colonies produced by *C. albicans* on Sabouraud's maltose agar at 25° C. in 24 to 48 hours are discrete, pale yellowish-brown, smooth, and glistening, with a crinkled surface when old. Those of *C. pinoyi* are discrete, pinhead to pea-sized, hemispherical, smooth, shiny, and beige-coloured.

Pityrosporon (*Microsporon* [*Malassezia*] *furfur*) [loc. cit.] may be differentiated from *C.* spp. by its pleomorphic spores (those of the latter genus being more uniformly lemon-shaped); the spores of *M. furfur* are also somewhat larger than those of *C.* spp. (3 to 7 μ in long diameter compared with 4 to 6 μ). Furthermore, the mycelium of *M. furfur* is absent on solid media but profuse in fluid ones, while with *C.* spp. the characters are reversed.

Notes are given on some clinical cases illustrative of infection by the above-mentioned organisms.

DOWLING (G. B.). **The pathogenicity of Monilia and other yeast-like fungi.**—*Brit. Journ. of Dermatology,* xlii, 12, pp. 562–568, 1930.

The results of two years' investigations on the pathogenicity of *Monilia* and allied fungi at the St. John's Hospital for Skin Diseases [see preceding abstract] have led the writer to form the following tentative conclusions. *M.* [*Candida*] *albicans, M.* [*C.*] *pinoyi*, and the 'spore of Malassez' or *Pityrosporon* [*Malassezia furfur*] are occasionally parasitic on the human skin. The pathogenicity of these fungi, however, is of a low grade, depending as much on the 'soil' as on inherent virulence. An accession of virulence may mark the parasitic phase, as demonstrated by the positive results of experimental transplantation of fungi freshly grown from lesions. Inoculation tests (by Dr. F. A. Knott) on laboratory animals gave further proof that the above-mentioned fungi are only weakly pathogenic, in marked contrast to the virulent character of those isolated from cases of broncho-moniliasis and other serious illnesses.

KISTIAKOWSKY (E. W.). **L'achromie, qui apparaît sous l'action des rayons ultra-violets du soleil sur le pityriasis versicolor, est-elle parasitaire ou post-parasitaire?** [Is the achromia developing under the action of the ultra-violet rays of the sun on pityriasis versicolor parasitic or post-parasitic?]—*Ann. de Dermatol.*, Sér. vii, i, 12, pp. 1264–1276, 4 figs., 1930.

The writer's studies on pityriasis versicolor at Kieff, Ukraine, and in Turkestan, have led him to a different interpretation of the etiology of the condition from that held by Gougerot and his collaborators [*R.A.M.*, ix, p. 244]. *Malassezia furfur* [see preceding abstracts] is destroyed by the action of the ultra-violet rays, the spores disappearing before the mycelium. Exfoliation ceases as a result of the destruction of the causal organism. The epidermal squamae, mycelium, and spores filter the ultra-violet rays, protect the skin from burning, and induce the formation of pseudo-achromatic patches. The condition of the skin is therefore a post-parasitic pseudo-achromia.

GOUGEROT [H.] & MEYER (J.). **Pityriasis versicolor achromiant, variété 'alba'.** [Achromatic pityriasis versicolor, *alba* variety.] —*Bull. Soc. Franc. de Dermatol., 1931*, 1, p. 46, 1931.

This is a brief note on the occurrence in a male patient of an atypical form of achromatic pityriasis versicolor, to which the name of '*alba* variety' is given. The affected regions of the skin were snow-white instead of coffee-coloured, the bleaching having occurred as a result of sun-baths. *Microsporon* [*Malassezia*] *furfur* [see preceding abstracts] was recovered from the white squamae. The hyphae were fewer, less torulose, and more slender than those of the same fungus isolated from the covered parts of the body.

GRIFF (FANNY) & ITKIN (M. M.). **Zur Ätiologie der Dyshidrosen.** [On the etiology of the dysidroses.]—*Acta Dermato-Venereologica*, xi, 6, pp. 508–526, 6 figs., 1930. [English summary.]

In 79 out of 90 cases of unmistakable dysidrosis examined in

Leningrad the presence of fungal elements was microscopically demonstrated. The dysidrotic vesicles and cutaneous squamae of the feet contained more of these than were found on the hands. In 25 out of 27 cultures Kaufmann-Wolf's *Epidermophyton* [*E. inguinale* or *E. floccosum*: *R.A.M.*, x, pp. 30, 243] was obtained. Morphologically this organism is considered to be most nearly related to the *Trichophyton gypseum* group. Inoculation tests on animals gave positive results (superficial desquamation without appreciable inflammation) only in the case of certain strains. The squamae were found to contain mycelium, and retrocultures were obtainable. The fungi in the remaining two cultures were *T. crateriforme* and an organism resembling *Microsporon lanosum*.

WISE (F.) & SULZBERGER (MARION B.). **Urticaria and hay-fever due to trichophytin (Epidermophyton interdigitale).**—*Journ. Amer. Med. Assoc.*, xcv, 20, p. 1504, 1930.

Details are given of a case of persistent skin eruptions, with occasional asthma and mild hay-fever, in a 32-year-old woman. Intradermal injections with trichophytin (0·1 per cent.) prepared from a fungus of the *Epidermophyton inguinale* group [see preceding abstract] produced generalized itching, violent sneezing, and other symptoms, which were relieved after 15 minutes by epinephrine hydrochloride given subcutaneously. This experience enlarges the list of allergic manifestations caused by the ringworm fungi or their products to include eczematous dermatitis, urticaria, asthma, and hay-fever [cf. *R.A.M.*, viii, p. 310].

CATANEI (A.). **Sur la production d'appareils sporifères par un champignon du groupe des Trichophytons à cultures faviformes.** [On the production of sporiferous organs by a fungus of the *Trichophyton* group with faviform cultures.]—*Comptes rendus Soc. de Biol.*, cv, 32, pp. 503–504, 1930.

Working at the Pasteur Institute of Algeria, the writer isolated, from a calf recently imported from France, a species of *Trichophyton* of the group producing faviform cultures. Using the technique devised by Langeron and Milochevitch [*R.A.M.*, x, p. 242], he grew the fungus in tube cultures on wheat grains on a thick layer of cotton saturated in water. The colonies developing at 28° C. were white and velvety, quite unlike those of smooth and waxy consistency obtained on the usual sugar agar. In addition to chlamydospores and arthrospores the fungus developed conidia measuring 4 to 4·5 by 2·5 to 3 μ, borne on conidiophores (generally simple) occurring in fascicles.

JADASSOHN (W.) & REHSTEINER (K.). **Experimentelle Hyphomyceteninfektionen am Auge. (Ein Beitrag zum Problem der Organotropie).** [Experimental Hyphomycete infections of the eye. (A contribution to the problem of organotropy).]—*Klin. Wochenschr.*, x, 7, pp. 308–310, 3 figs., 1931.

The inoculation of the cornea of guinea-pigs with pure cultures of *Achorion quinckeanum* gave entirely negative results, but the injection of spore suspensions of the same fungus, *A. schoenleini*,

and *Trichophyton gypseum* into the lenses of guinea-pigs and rabbits was successful, the organisms making good growth in the deeper cortical layers. This is believed to be the first record of fungous infection of the cornea [but see *R.A.M.*, ix, p. 782] and is considered as supporting the view that certain Hyphomycetes are capable of developing only in 'non-living' tissues. [An account of this work also appears in *Zeitschr. für Augenheilkunde*, lxxii, pp. 232–233, 1930.]

MERIIN (J.). **Zur Mykologie der Chromoblastomykose. (Der Erreger des europäischen Falles der Erkrankung).** [On the mycology of chromoblastomycosis. (The causal organism of the European case of the disease).]—*Arch. für Dermatol.*, clxii, 2, pp. 300–310, 5 figs., 1930.

Full details are given of the cultural and morphological characters of *Hormodendrum rossicum* n. sp., the fungus found to be responsible for the case of chromoblastomycosis described some time ago from Leningrad [*R.A.M.*, ix, pp. 718, 719].

AGOSTINI (ANGELA). **Dermatomicosi dovuta a Eurotium rubrum Bremer.** [Dermatomycosis due to *Eurotium rubrum* Bremer.] —*Atti Ist. Bot. R. Univ. di Pavia*, Ser. iv, ii, pp. 65–79, 5 figs., 1930.

From a lesion on the scalp of a male patient at Bologna a fungus was isolated which in culture on various media was characterized by a hyaline, moniliform, closely septate mycelium bearing conidiophores which measured 100 to 400 by 7 to 13 μ, and on which developed at the swollen tip chains of oval to globular conidia, 5 to 8 by 3 to 5 μ in diameter. Spherical, membranous, yellow to fuliginous perithecia, 80 to 150 μ in diameter, were also formed; these contained numerous globose asci 10 to 12 μ in diameter, each with eight lenticular ascospores 5 to 6 μ in diameter. Perithecial formation followed immediately on the development of the conidiophores. The fungus, which has not previously been recorded on man, was identified as *Eurotium rubrum* [Saccardo's diagnosis of which is expanded].

A list is given of 24 pathogenic species of *Eurotium* included by other workers in the genus *Aspergillus* [*R.A.M.*, v, p. 700] but which the author considers should rightly be assigned to *Eurotium* as their perithecia are known.

[An abstract of this paper appears in *Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iii, 1, pp. 24–25, 1931.]

OHUE (T.). **On a fungus found in the urine and the cerebrospinal fluid of a patient suffering from meningitis.**—*Science Repts. Tôhoku Imper. Univ.*, Ser. 4 (Biology), v, 1, pp. 119–132, 3 pl. (1 col.), 2 figs., 1 graph, 1930.

Notes are given on a fungus, identified as *Alternaria tenuis*, isolated from the urine and spinal fluid of a patient who developed temporary symptoms of meningitis after eating dried persimmons containing many similar spores.

RODENHISER (H. A.). **Physiologic specialization and mutation in Phlyctaena linicola Speg.**—*Phytopath.*, xx, 12, pp. 931–942, 3 figs., 1 graph, 1930.

This is an expanded account of the writer's investigations on physiological specialization in *Phlyctaena linicola*, the causal organism of the pasmo disease of flax, a preliminary notice of which has already been published [*R.A.M.*, ix, p. 384].

SYDOW (H.). **Über einige interessante deutsche, auf Kompositen vorkommende Puccinien.** [On some interesting German species of *Puccinia* occurring on Compositae.]—*Ann. Mycol.*, xxviii, 5–6, pp. 427–431, 1930.

Attention is drawn to the detection by Dr. H. Poeverlein, in 1922 and again in 1930, of *Puccinia leucanthemi* (hitherto known only in two localities of northern Italy) on *Chrysanthemum leucanthemum* in the Palatinate (Germany). *C. segetum*, *Matricaria chamomilla*, and *Anthemis arvensis* were attacked near Cuxhaven by *P. anthemidis*, which presumably passed from the last-named host to the two others.

SCHMOUTZ (A.). **Nochmals: Fusskrankheit der Sommerastern.** [A further note on the foot rot of Summer Asters.]—*Gartenwelt*, xxxiv, 52, p. 716, 1931.

The writer first observed the foot rot [*Fusarium* sp.] of summer asters [*Callistephus chinensis*] in his nursery at Dienze, Germany, in 1921 [*R.A.M.*, x, p. 246, and next abstract]. The disease appears to be specially favoured by the repeated cultivation of the plants in infested soils, and in such soils at least eight years should be allowed to elapse between successive aster crops. Good results have been obtained by steeping the seed in uspulun, sowing in sandy soil, transferring the seedlings to a cold frame containing sandy soil with an admixture of peat mould, and giving them weekly applications of a 0·5 to 3 per cent. solution of potash and phosphorus. The planting-out beds should be manured the previous autumn, strewn with potash before transplanting, and afterwards covered with horse dung or peat mould.

SCHWARTZ (G.). **Die Welkekrankheit der Sommerastern und ihre Bekämpfung.** [The wilt disease of Summer Asters and its control.]—*Blumen- und Pflanzenbau*, xlvi, 1, pp. 10–11, 1 fig., 1931.

Popular notes are given on the wilt disease of summer asters [*Callistephus chinensis*] caused by *Fusarium* spp. in Saxony [see preceding abstract]. The trouble is not confined to any particular type of soil but is equally prevalent on dry sand or heavy clay. The general opinion that wilt occurs chiefly on very acid soils was shown by the writer's investigations to be incorrect, the hydrogen-ion concentrations in three affected localities being P_H 6·02, 6·7, and 6·18, respectively. The beneficial effect of lime must therefore be attributed to its disinfective action rather than to any alteration in the soil reaction. Control measures should include the use of fresh soil for the seed-beds or disinfection of old soil either by steam sterilization or sprinkling with 0·5 per cent. uspulun or 2·5

per cent. formaldehyde (10 l. per sq. m.) three weeks before sowing at the latest; seed disinfection with uspulun; quadrennial crop rotation in the planting-out beds if possible, or sterilization of the soil by the above methods; and avoidance of fresh organic manure.

PAPE (H.). **Eine Triebwelke bei Crassula rubicunda.** [A wilting of the shoots of *Crassula rubicunda.*]—*Gartenwelt.*, xxxiv, 50, pp. 691–692, 2 figs., 1930.

In the late autumn and winter of 1929–30, the leaves of some *Crassula rubicunda* plants growing in pots in a greenhouse at Kiel (Germany) were observed to show a livid, greyish-green discoloration, wilting, and desiccation. The base of the shoots showed a dark brown discoloration and shrivelling for a length of 0·5 to 1 cm. from their junction with the stem, giving a constricted appearance. The diseased cortical and woody tissues at the base of the shoot were permeated with mycelium. The falcate, pluriseptate, pink spores developing on the surface of the diseased cortex were identified by Wollenweber as those of *Fusarium herbarum* var. *graminum*, to which the disease is attributed.

POEVERLEIN (H.). **Die Gesamtverbreitung der Uropyxis sanguinea in Europa.** [The distribution of *Uropyxis sanguinea* throughout Europe.]—*Ann. Mycol.*, xxviii, 5–6, pp. 421–426, 1930.

A list is given of the localities in Germany, Scotland, Holland, Denmark, Norway, Sweden, Finland, Latvia, Poland, Czecho-Slovakia, France, and Switzerland in which *Uropyxis sanguinea* [*Puccinia mirabilissima*] has been found on *Mahonia* [*Berberis*] *aquifolium*, with the dates of detection wherever they are known [*R.A.M.*, x, p. 109]. The first European record was in Scotland in 1922 [ibid., ix, p. 530]. In all probability the rust was introduced into Europe from North America some 15 or 20 years ago. Its prevalence along the coasts of the North Sea and the Baltic suggests that optimum conditions for the growth of *P. mirabilissima* obtain in these regions. The rust usually occurs in the uredo stage, teleutospores seldom being observed, while aecidia are extremely rare. Dietel is convinced that the aecidia found on this host in Brandenburg and Pomerania are those of *P. mirabilissima* and not of *P. graminis*, the aecidiospores of the former being deficient in the apical thickening characteristic of the latter, while the peridia of *P. mirabilissima* have a golden-yellow margin instead of a whitish or occasionally yellow one, as in *P. graminis*. Another difference between the two species is the presence, among the aecidiospores of *P. mirabilissima*, of numerous highly refractive membrane globules (up to 10 or 12 adhering to each spore), a feature that is much less conspicuous in *P. graminis*.

MELHUS (I. E.) & PATEL (M. K.). **Study of Peronospora trifoliorum De Bary on species of Leguminosae.**—*Proc. Iowa Acad. Sci.*, xxxvi (*1929*), pp. 113–119, 1 fig., 1 graph. [? 1930. Received February, 1931.]

The conidia of *Peronospora trifoliorum*, the fungus causing downy mildew of lucerne [*R.A.M.*, ix, p. 187], were found to

germinate at a temperature range of 4° to 28° C., with an optimum at 18°. Germination always took place by means of a germ-tube. The minimum time required for germination at the optimum temperature was three hours. The conidia retained their viability after a maximum of seven days' freezing. The measurements of the reproductive organs were found to be as follows: conidiophores 110 to 680 μ in length, conidia 25·5 to 30·5 by 14·5 to 15·5 μ, and oospores 18 to 37 μ.

Twelve varieties of lucerne were successfully inoculated, the fungus developing most profusely at a temperature range of 15° to 22° combined with high humidity. *Medicago lupulina* proved very resistant to infection by *P. trifoliorum*, while a number of other legumes [which are listed] were immune.

CUNNINGHAM (G. H.). **Five years' progress in orchard diseases control.**—*The Orchardist of New Zealand*, iii, 9, pp. 9–12, 1930.

In this paper (read before the Dominion Conference of the New Zealand Fruitgrowers' Federation, 1930), in which the author briefly reviews five years' progress in the control of orchard diseases, reference is made to the improved control of brown rot of stone fruits (*Sclerotinia cinerea*) [*S. americana*] recently made possible by improved orchard hygiene [cf. *R.A.M.*, ix, p. 115], and of powdery mildew of apples (*Podosphaera leucotricha*) by new methods of spraying, as well as to the influence now known to be exercised by the root stocks upon the susceptibility of the trees [ibid., x, p. 37]. It is also pointed out that scorching has been largely eliminated by the use of alkaline Bordeaux mixture made with commercial hydrated lime, and that good control of apple and pear black spot [scab: *Venturia inaequalis* and *V. pirina*] has been given by calcium monosulphide [ibid., viii, p. 387].

The mode of action of sulphur and its compounds is briefly discussed and mention is made of the increased fungicidal value said to be brought about by the addition of oxidizing agents. An analysis of numerous commercial brands of so-called precipitated sulphur sold in New Zealand showed that all those tested consisted of sublimed sulphurs with the addition of fuller's earth or soap.

In 1929, New Zealand apples in transit to England developed less than 1 per cent. flesh collapse and scald [ibid., ix, p. 533], though in a few shipments there was 60 per cent. bitter pit and 40 per cent. fungous rots; in this connexion, a note is given on the importance of the time of picking and on Carne's iodine test for maturity [ibid., ix, p. 322] in relation to bitter pit.

KLEIN. **Eine stationäre Spritzanlage zur Schädlingsbekämpfung in Deutschland.** [A stationary spraying plant for pest control in Germany.]—*Nachricht. über Schädlingsbekämpf.*, v, 4, pp. 193–195, 2 figs., 1930.

Drawing attention to the constant increase in the quantities of American and Australian over home-grown fruit on the European markets, the writer points out that the popularity of this produce is largely due to its superior appearance, a feature obtainable

solely by suitable methods of disease treatment. Details are given of a stationary spraying plant for the control of fruit pests and diseases (primarily the apple blossom weevil [*Anthonomus pomorum*] and scab [*Venturia inaequalis*]), which has recently been installed in a 6-acre orchard near Werder (Mark Brandenburg). The cost of the piping is estimated at M. 1 per running m. for the 250 m. of the network, exclusive of pump and motor. Nosprasit has been found effective for use with the new plant.

HOWARD (F. L.). **Do significant physiological strains of Bacillus amylovorus (Burr.) Trev. exist?**—*Proc. Iowa Acad. Sci.*, xxxvi (*1929*), pp. 105–110. [? 1930. Received February, 1931.]

Cultures of the fireblight organism (*Bacillus amylovorus*) were collected from various parts of the United States and New Zealand [see next abstract] with a view to determining the possible existence of physiologic strains. The cultures were found to vary slightly in their toleration of H and OH ions, the organism being apparently more tolerant of malic than of hydrochloric acid. Variations in the hydrogen-ion concentration of quadruplicate tubes of nutrient sugar broths were generally slight, and there was no positive correlation between the capacity for effecting a reversion of reaction and the fermenting power or growth. In these tests [the results of which are tabulated], the maltose cultures did not become acid as stated by Waite (*Proc. Amer. Assoc. Adv. Sci.*, xlvii, p. 427, 1898).

In a study of the relative pathogenicity of the cultures some differences were observed in varietal resistance to infection. About 10 per cent. of the inoculations in King and Northern Spy apples failed to cause infection, the corresponding figures for McIntosh apples and Kieffer pear terminals being 25 and 65 per cent., respectively. The culture of *B. amylovorus* from Grand Rapids, Michigan, readily induced blight on Kieffers. The incubation period of the disease was three to four days for King terminals, five to nine for McIntosh, and six to ten for Northern Spy.

The writer concludes that the slight differences occurring in the physiological reactions of the various cultures of *B. amylovorus* are insufficient to justify the establishment of distinct strains. In fact, the species may be considered exceptionally constant in view of the very varied sources of the cultures.

REID (W. D.). **The diagnosis of fireblight in New Zealand.**—*New Zealand Journ. of Sci. and Tech.*, xii, 3, pp. 166–172, 2 figs., 1 map, 1930.

Fireblight (*Bacillus amylovorus*) has now extended throughout the orchard areas of North Island, New Zealand, and has been observed in two districts of South Island [*R.A.M.*, viii, p. 795]. Although no direct evidence is forthcoming, the spread of the disease into new districts is believed to be due to human agency.

The laboratory diagnosis of fireblight is discussed in relation to three definite methods of determination, viz., microscopic, inoculation, and morphological and physiological characters of the causal organism [the technical diagnosis of which is given]. The strain of *B. amylovorus* isolated from New Zealand material [see pre-

ceding abstract] is stated to differ slightly from the descriptions given by Stewart (*Cornell Univ. Bull.* 329, 1913), E. F. Smith (1920), and Bergey (Manual of Determinative Bacteriology, 1925), in the size of the rods, number of flagella, and rate of gelatine liquefaction. In New Zealand specimens the rods measure 0·5 to 1·2 by 0·45 to 0·6 μ for single cells or 1·7 by 0·6 μ for pairs (average 1·1 by 0·5 μ), the size in certain strains being regularly small (0·45 by 0·8 μ); the peritrichiate flagella average five for single rods and up to thirteen for pairs, and measure 10 to 12 μ in length. Gelatine is liquefied within five days.

Details are given of inoculations on apple and pear shoots and fruits; the late maturing Kieffer pear fruits have proved useful for late-season inoculations, producing the characteristic exudation up to 26th March. Hawthorn [*Crataegus*] and quince shoots are also suitable for inoculation with *B. amylovorus* [ibid., ii, p. 273], whereas plum, cherry, and rose shoots have so far remained immune. Two new hosts of the parasite in New Zealand are loquat (*Eriobotrya japonica*) [ibid., vi, p. 175] and *Pyracantha angustifolia.*

THOMAS (H. E.). **The longevity of Bacillus amylovorus (Burr.) Trev. in association with honey.**—*Science*, N.S., lxxii, 1877, p. 634, 1930.

The occurrence of the fireblight organism, *Bacillus amylovorus*, in honey from the beehive has already been demonstrated [*R.A.M.*, ii, p. 452; x, p. 111], but experiments at Berkeley, California, suggest the advisability of further investigations on the connexion between the disease and bees or their hives. It was found that when active bacterial exudate from blighted pear twigs was applied to the wood, wax, and honey of a frame placed in a covered dish in the dark the organism was recovered after 20, 55, and 15 days, respectively. It is is thus clear that *B. amylovorus* may be transferred through the hive from diseased to healthy plants, or even moved with the hive from one area to another, especially when hives are moved for the purpose of effecting pollination in apple orchards. It is even possible, though hardly probable, that they may occasionally survive in the hive from one season to the next. In this connexion it may be mentioned that virulent cultures were isolated at Ithaca, New York, from fair-sized drops of the exudate on apple twigs kept dry in the laboratory for 12 months.

HUS (P.). **Proeven met verschillende middelen tegen Appelschurft (Fusicladium dendriticum).** [Experiments with various preparations against Apple scab (*Fusicladium dendriticum.*)] —*Tijdschr. over Plantenziekten*, xxxvi, 12, pp. 286–288, 1930.

The best results in the control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*] in a recent series of experiments in Holland was given by two applications of Bordeaux mixture ($\frac{1}{4}$ kg. copper sulphate and $1\frac{1}{2}$ kg. lime per 100 l. water), which reduced the incidence of infection from 48·9 to 18·8 per cent., the corresponding figures for two applications of lime-sulphur at 2·5 per cent., four applications of lime-sulphur at 2·5 per cent.,

four applications of lime-sulphur at 1 per cent., and four applications of sulphur dust (the first with kolotex and the others with kolodust) [*R.A.M.*, viii, p. 652] being 44·3, 49·6, 42·4, and 38·2 per cent. However, owing to the severe injury inflicted on the leaves and fruit by the Bordeaux mixture, its use cannot be recommended. No definite conclusion as to the respective merits of spraying and dusting from a practical standpoint can be reached on the basis of these tests. Two men can spray one tree in two minutes, while a somewhat longer time is necessary for dusting; here, however, only one person is required. The Platz 6 h.p. dusting apparatus [*R.A.M.*, ix, pp. 128, 556] gave satisfactory results in these tests.

WIESMANN (R.). **Ueber Schorfbefall der Lageräpfel.** [On scab infection of stored Apples.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 26, pp. 517–522, 2 figs., 1930.

Heavy damage may be caused to stored apples in Switzerland by scab [*Venturia inaequalis*: *R.A.M.*, x, p. 114]. Under normal conditions the fungus is unable to germinate in storage rooms, since the presence of free water has been found by the author to be essential to this process [cf. for pear scab conidia, ibid., x, p. 252]. Spores dried on a slide or on the surface of the fruit did not germinate in a moist chamber in a practically saturated atmosphere. After 6 and even 10 weeks most of the dried spores were still viable. Infection, therefore, must be present in an incipient stage in the fruit before it is placed in storage. This was found to be actually the case with the susceptible Jacques Lebel, Gold Pearmain, and Oberdiecksreinette varieties, which appeared perfectly healthy on harvesting but were found on microscopic examination to have minute dark spots with incipient new infections in the epidermis, and developed extensive spotting in storage at 4° C. and 80 per cent. humidity. A preliminary disinfection with 0·05 per cent. formalin or 1 per cent. sulphuric acid for half-an-hour did not check this. The germination of the fungus is not prevented by a low temperature (1° C.).

D'OLIVEIRA (B.). **Podridão rósea do coração das Maçãs.** [Pink rot of Apple cores.]—*Revista Agronómica*, xviii, 3, pp. 49–63; 4, pp. 9–67, 3 pl., 29 figs., 1 graph, 1930. [English summary.]

A comprehensive account is given of the writer's morphological and cultural investigations on the causal organism of pink rot of the apple core [*R.A.M.*, x, p, 114], which is stated to be responsible for extremely heavy losses to Portuguese apple growers. In the Beira Alta district the harvest is sometimes a complete failure from this cause.

Discussing the taxonomy of the fungus, the writer cites the Latin diagnoses of *Trichothecium roseum* Link and *Cephalothecium roseum* Corda, all the supposed morphological variations between which are considered to arise as a result of cultivation on different media, the characters of the fungus on 2 per cent. glucose agar remaining perfectly constant. In an amended diagnosis in Latin, the conidia are described as piriform, octoform, or oblong-obovate, tapering or truncate at the base, pale pink, and measuring 12 to 22 by 7 to 12 μ (12 to 18 by 8 to 10 μ in *T. roseum* Link). As the

measurements found by the author correspond to those given by Corda for *C. roseum*, this name is adopted by the author. [In date of publication, however, Link's name, dated 1809, takes precedence of Corda's (1838)].

The optimum temperature for the growth of *T. roseum* was found to be 22° C., the maximum between 31° and 38°, and the minimum between 5° and 7°. Vegetative development is favoured by humidity. The fungus liquefies gelatine and white of egg; when grown in milk it precipitates casein which subsequently undergoes partial liquefaction. Good growth was made on all the carbohydrates tested (glucose, levulose, saccharose, lactose, maltose, and a number of others), with the exception of dulcite. The development of *T. roseum* is inhibited by malic acid at concentrations above 0·4 per cent. It was found possible to distinguish the different strains of *T. roseum* by serological methods. Tests of the toxic action of filtrates of the fungus on various plant tissues showed that the time required for the appearance of a toxic effect ranged from 7 hours (destruction of carrot tissue by filtrate of 40-day culture on potato decoction with glucose) to about 3 days for green Pearmain apples treated with the same filtrate and the filtrate of a 30-day culture on apple decoction [cf. ibid., vii, p. 338]. Inoculation experiments with *T. roseum* gave positive results on apples (Bravo de Esmôlfe, Reinette, and Pearmain), pears, quinces, medlars, Rosa peaches, Fernão Pires grapes, and Bacorinhos and Pingo de Mel figs.

Since *T. roseum*, under natural conditions, almost always develops on scab (*Fusicladium*) [*Venturia inaequalis*] lesions, in the galleries of *Carpocapsa* [*Cydia*] *pomonella*, or on wounds inflicted by various agents, it is best controlled by cultural measures aiming at the elimination of these injuries. The fruit should be picked just before maturity and stored in a cool, dry, well-ventilated place, the periodical disinfection of which with formol is advisable. The apples should be wrapped in paper impregnated with 15 per cent. mineral oil for the prevention both of infection by *T. roseum* and of scald [ibid., iii, p. 215 *et passim*]. Diseased fruits should be removed and the shelves washed with 1 per cent. copper sulphate.

RUEHLE (G. D.). **Stemphylium congestum and its relation to decay in Apples.**—*Mycologia*, xxii, 6, pp. 304–309, 2 figs., 1930.

The author states that from 1,118 isolations from decayed apples from cold storage he obtained 29 cultures of two strains of *Stemphylium congestum* Newton [*R.A.M.*, x, p. 227] which differed from each other chiefly in the size of their spores, and which were compared culturally with a stock culture of the organism from the Washington Experiment Station. The strain with the larger spores was found to agree in all respects with the stock culture, but the study revealed the presence both in the form isolated by the author and in that from the stock culture on certain culture media (especially 2 per cent. dextrose potato agar and Czapek's modified synthetic medium) of spore types which are believed not to have been seen by Newton. Besides the botryose clusters of sphaeroquadrilateral conidia described by the latter (which are dominant),

many of the conidia were found to be borne in short chains, the basal spore being obclavate in shape and resembling an *Alternaria* spore; at first such spores were thought to be a contamination with *Alternaria*, but when single spores of this type were grown the resulting colonies again produced both types of spores. The formation of some of the spores in short chains was also a constant characteristic of the strain with smaller conidia, which was also found to agree in all essentials with *S. congestum*, except in the size of the spores (average 16·5 by 10·6 μ). This form is therefore considered to be a variety of *S. congestum*, a description of which is given under the name *S. congestum* var. *minor* nov. var. A revised description is also given of the type species.

Inoculation experiments [brief details of which are given] with *S. congestum* and the new variety on ripe Jonathan and Rome Beauty apples indicated that the organism is of little economic importance on apples at cold storage temperatures, but may be very injurious under common storage conditions. It is pointed out that the lesions produced by this fungus may be readily mistaken for lesions caused by several species or strains of *Alternaria*, and it is thought probable that a large proportion of the decay which in the Pacific Northwest is usually attributed to *Alternaria*, is really caused by *S. congestum*.

WORMALD (H.). **Further studies of the brown-rot fungi. V. Brown-rot blossom wilt of Pear trees.**—*Ann. of Botany*, xliv, 176, pp. 965–974, 2 pl., 1930.

A brief description is given of a blossom wilt of Fertility pear trees caused by *Monilia* (*Sclerotinia*) *cinerea* which was observed in 1921 at the South-Eastern Agricultural College, Wye, and in 1925 at Wisborough Green, Sussex. Previous to this the fungus had been found on an undetermined pear fruit in East Kent in 1915, on a similar fruit from Exeter in 1921, and finally, associated with a blossom and leaf wilt of an undetermined pear tree from Cambridgeshire in 1920. The organism isolated from infected organs of the Fertility pear trees was shown to be morphologically and culturally indistinguishable from *S. cinerea* f. *pruni*, to which it is referred.

Details are given of inoculation experiments from 1924 to 1929 at the East Malling Research Station with the strain isolated from the Fertility pear trees, and with strains isolated from plum and from cherry, the results of which showed that all the strains produced typical blossom-wilt on Fertility pear trees [cf. *R.A.M.*, x, p. 158]. In the experiment with the cherry strain it was observed on some of the pear spurs that when the discoloration had reached the base of one or both of the inoculated flowers and had entered the inflorescence axis, it then extended upwards along the pedicels and petioles before the whole truss wilted. On such leaves the discoloration travelled along the midrib and thence laterally into the lamina. The strain from pear trees was also demonstrated to be capable of producing a definite rot of half-grown and quite green plums on trees in the open, when inoculated through punctures.

In a single inoculation experiment with a pear strain of *S.*

cinerea on apple flowers, complete infection of the whole truss occurred in one of the six inflorescences inoculated, and later the fungus was recovered from the spur invaded by the mycelium. The pear strain reisolated differed from *S. cinerea* f. *mali*, which was also used in the experiment, in its almost colourless growth on prune agar, while the apple strain produced a dark brown coloration. Early symptoms of infection, with browning of the styles to the base, were observed, however, in all the inflorescences that were inoculated.

HUTCHINS (L.). **Une maladie à virus du Pêcher (phony Peach).** [A virus disease of Peach (phony Peach.)]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 8–9, pp. 383–384, 2 pl., 1930.

A brief, popular account is given of the virus disease of peaches long present in Georgia, United States, and known as phony peach, a more detailed description of which, by the same author, was recently noticed from another source [*R.A.M.*, ix, p. 727].

PHILP (G. L.). **Cherry culture in California.**—*California Agric. Extens. Serv. Circ.* 46, 42 pp., 17 figs., 2 diags., 1 map, 1930.

Popular notes are given (pp. 33–35) on some diseases affecting the Californian cherry crop and their control. Bacterial gummosis (*Bacterium cerasi*) [*Pseudomonas cerasus*: *R.A.M.*, vii, p. 563] is apt to cause heavy losses, especially on the Mazzard types of tree and on the Bing and Napoleon varieties, the Duke and sour cherries being highly resistant and Lambert seldom affected. Sweet cherry trees on Stockton Morello roots appear to be less susceptible than those on ordinary Mazzards. Promising results in the control of this disease have been obtained by the scarification method used against pear blight [*Bacillus amylovorus*: ibid., vii, p. 791], Bordeaux paste being applied to the excised areas to prevent rotting.

Brown rot (*Sclerotinia cinerea*) [ibid., x, p. 163], though not usually serious on cherries, may cause considerable damage under humid conditions. The application of 5–5–50 to 8–8–50 Bordeaux mixture as the first blossoms open gives good control except when rain occurs at harvest time.

Leaf spot (*Coccomyces hiemalis*) [ibid., x, p. 116] may affect the fruit stem as well as the leaves, causing heavy damage in the coastal regions, while the oak fungus (*Armillaria mellea*) [ibid., v, p. 37] sometimes kills the trees in areas which expand from year to year.

'Buckskin', a disease of obscure origin chiefly affecting the Napoleon, Black Tartarian, and Chapman varieties on Mazzard roots [ibid., ix, p. 766], is characterized by stunting and malformation of the fruit, which reaches only quarter or half its normal size, the flesh being tough and of a translucent appearance. Trees grafted on Mahaleb roots seem to be highly resistant to this disturbance.

'Crinkle' [ibid., viii, p. 550], also known as 'red bud', 'bachelor tree', and 'he tree', is commonly found on the Black Tartarian variety, causing malformation, crinkling, and mottling of the foliage either of a single branch or of the whole tree. Many of

the fruit buds fail to open fully, and in severe cases the fruit has a pointed, beaked appearance. Like 'little leaf', with which it is sometimes associated, 'crinkle' may possibly be due to unfavourable soil conditions. Trees affected by 'little leaf' have weak shoots and small, yellow leaves. Sometimes a shoot dies back partially and many new shoots grow out, giving a witches' broom effect.

RIÓS (P. G.). **Cultivo del Banano en Puerto Rico.** [Cultivation of the Banana in Porto Rico.]—*Puerto Rico Dept. Agric. y Trab., Estac. Exper. Insul. Bol.* 36, 58 pp., 14 figs., 1930.

This paper contains (pp. 43–47) some popular information on the two chief fungous diseases affecting bananas in Porto Rico, viz., Panama disease (*Fusarium cubense*) [*R.A.M.*, vi, p. 536] and anthracnose (*Gloeosporium musarum*) [ibid., v, p. 377]. The varieties most susceptible to Panama disease are Guineo Gigante (*Musa sapientum*) and plantains (*M. paradisiaca*), while *G. musarum* occurs mainly on Guineo Enana (*M. cavendishii*). On p. 33 the Monte Cristo variety (*M. sapientum*) is stated to be so far resistant to *F. cubense*.

HOLMES (E.). **The Canary Banana. Banana cultivation in the Canaries.**—*Trop. Agriculture*, vii, 12, pp. 320–325, 2 pl., 1930.

In this paper the author gives a brief description of the methods used in the cultivation of the banana in the Canary Islands, and in the control of fungal diseases and insect pests which attack this crop there. The only two parasitic diseases mentioned are one caused by a species of *Fusarium* closely resembling *F. cubense* [see preceding abstract], and the 'cigar end' or 'finger-tip' rot of the fruits caused by a species of *Verticillium* (*Stachylidium*) [ibid., vi, p. 465; ix, p. 729]. The *Fusarium* disease is of relatively minor economic importance, and is locally treated by the removal of the diseased plants, and by heavy liming of the soil.

WARDLAW (C. W.). **The biology of Banana wilt. (Panama disease). II. Preliminary observations on sucker infection.**—*Ann. of Botany*, xliv, 176, pp. 917–956, 74 figs., 1930.

This paper is in continuation of the author's detailed study of the biology of the banana wilt fungus (*Fusarium cubense*) at the Imperial College of Agriculture, Trinidad [*R.A.M.*, ix, p. 795]. It gives a full description and discussion of preliminary experiments conducted with a view to investigating the behaviour of Gros Michel banana suckers during the early stages of infection, a condensed report on which has already been noticed [ibid., viii, p. 797]. In addition to the information already given in the latter, the following points are of interest. Anatomical investigation of inoculated susceptible suckers showed that after some time the further penetration of the organism into the tissues was opposed by the formation of suberized cambiform tissue in the ground parenchyma at right angles to the direction of invasion. The fungus kills the host tissue in advance of its penetration by the diffusion of toxic substances which, as indicated by experiments in which the cut ends of suckers were immersed in staled culture solutions of *F. cubense*, can induce in

the course of four days important protective reactions in the host, including the removal of starch, the suberization of cell walls, and the formation of cambiform tissue. There was also evidence that, whereas in root infection structural changes take place which keep the hyphae out of the wood vessels, in the sucker, once the vessels are invaded, similar structural changes occur by which the hyphae are kept within the vessels. A preliminary account is also given of the penetration of the fungus into the bases of the roots.

Comparative inoculations of Gros Michel suckers in closed moist chambers and in uniformly moist, well-aerated soils indicated that the extent of infection and the power of the plant to react to it are dependent on certain environmental conditions, among which vitiation of the atmosphere with carbon dioxide or inadequate aeration is an important factor.

SIDERIS (C. P.) & PAXTON (G. E.). **Heart rot of Pineapple plants.**—*Phytopath.*, xx, 12, pp. 951–958, 4 figs., 1930.

Further observations are made on the heart or stem rot of pineapples in Hawaii [*R.A.M.*, ix, p. 325], caused by *Phytophthora meadii*, *P. melongenae*, and *Pseudopythium phytophthoron* n.g., n.sp. (technical details of which are reserved for future publication). These three fungi have been repeatedly isolated from diseased pineapple plants and inoculated into healthy individuals with positive results.

P. phytophthoron generally enters the plant through the roots, while the two other fungi concerned in the causation of heart rot penetrate the leaf bases. In attacks of *P. phytophthoron*, stem and leaf rot develop after the leaves have become discoloured and flaccid as a result of root destruction, while with *Phytophthora meadii* and *P. melongenae* discoloration of the foliage and rotting of the stem and leaves occur simultaneously. Pineapple plants attacked by *Pseudopythium phytophthoron* are killed by the direct destruction of the root system. The aerial organs are invaded either indirectly, through the initial root infections, or directly, by invasion of the stem through the tender tissues of the leaf bases. This fungus has so far been found only in one 20-acre field on the island of Oahu; its development appears to be favoured by temperatures below 70° F. accompanied by abundant moisture. The only other plant hitherto found to be susceptible to *P. phytophthoron* is the onion, which is also liable to infection by *Phytophthora meadii* and *P. melongenae*.

P. meadii is the most prevalent of the three organisms under discussion, the strain on pineapples differing from authentic cultures of this species from Baarn in a more profuse development of aerial mycelium. It produces heart rot chiefly in young plants, one week to six months old, the initial invasion occurring through the axils of either basal or apical leaves, the basal tissues of the stem, or the roots. The fungus lives in the soil and is transferred to the leaf axils by means of wind, cultivating implements, and the splashing and overflow of water during heavy rains. The disease is most severe during the cool, wet winter months. *P. melongenae* has been found to be even more aggressively parasitic

than *P. meadii*, to which it is otherwise very similar in pathogenic behaviour.

The only control measure which can yet be recommended on the basis of observations in the diseased areas is the adoption of the high-bed planting system, which effectively prevents flooding of the plants and appreciably reduces the chances of infection.

Mango hoppers and mildew and their control.—*Bombay Dept. of Agric. Leaflet* 6, 4 pp., 4 pl., 1930.

Popular notes are given on the occurrence of powdery mildew of mango flowers and fruits [*Erysiphe cichoracearum*] in the Bombay Presidency [*R.A.M.*, viii, p. 654], where the losses from this cause may amount to between 5 and 20 per cent., mostly during February and March. The most economical and effective remedy for the disease is the application of sulphur, a satisfactory brand of which, passing through a sieve with 200 meshes per sq. in., is now available in India at a cost of Rs. 185 per ton retail [about £13 17*s*. 6*d*]. Three applications of sulphur with a Peerless Dust Gun (obtainable from Messrs. Dharamsi Morarji Chemical Company, Ltd., Bombay, at a cost of Rs. 56 [£4 4*s*.]) are recommended, the first being made soon after flowering, the second about 15 days later, and the third a fortnight after the second. The total cost (including labour) of treating one tree 25 ft. in height is estimated at 4 annas, 9 pies [about fivepence] and the average profit at Rs. 7 to 8 [10*s*. 6*d*. to 12*s*.].

Dusting versus spraying for fungus control.—*New Zealand Journ. of Agric.*, xli, 6, p. 418, 1930.

After pointing out that in seasons when fungal infection is severe spraying gives better control than dusting, the writer states that in New Zealand, where dusts cost at least three times as much as spray materials, dusting is too expensive to be practicable. Further, the greater effectiveness attributed to dusts as compared with Bordeaux mixture is in some cases due to the faulty preparation of the latter.

HERMAN (F. A.). **Some chemical problems involved in the study of insecticides and fungicides.**—*Twenty-first Ann. Rept. Quebec Soc. Protect. Plants*, pp. 10–16, 1929. [Received November, 1930.]

The materials dealt with in this paper are mainly insecticides, but the electric charges of certain dusts used as fungicides are discussed.

Metallic dust when blown about in the air becomes negatively charged, as does that of basic oxides, while acid oxides become positively charged. The nature of the charge possessed by certain dusts was tested by the electroscope and the results are listed in a table prepared in conjunction with Moran and Davis. Lime hydrate had a scale deflection of $+1{\cdot}2$, casein $+2{\cdot}2$, sulphur $-6{\cdot}1$, and sulphur-lead arsenate $0{\cdot}0$.

THOMAS (K. M.). **A practical method of estimating disease resistance in crop plants.**—Reprinted from *Madras Agric. Journ.*, xix, 1, 8 pp., [Received January, 1931.]

The writer has devised a method for the estimation of disease resistance in crop plants under Madras conditions. The principles underlying the method are the cultivation of varieties and strains under natural conditions and in identical environment; the provision of identical facilities to all varieties for exposure to infection and natural development of the disease; the growing of sufficiently large numbers of individuals in each variety to obviate errors of observation; a close study of an equal number of individuals in each variety and a careful estimation of the incidence of infection; and the evaluation of the extent of the disease and the loss due to it among the several varieties under trial. The application of the method to blast of rice (*Piricularia oryzae*) [see below, p. 337], mosaic of sugar-cane, and wilt of groundnuts (*Rhizoctonia bataticola*) [*Macrophomina phaseoli*] is explained.

VOISENAT. **Contrôle de l'état sanitaire des semences à la station officielle de contrôle des semences de Wageningen.** [Examination of the state of health of seeds at the official seed-testing station at Wageningen.]—*Ann. Sci. Agron.*, xlvii, 6, pp. 744–754, 1930.

A full account is given of the methods employed at the Wageningen (Holland) seed-testing station for the detection of seed-borne insects and fungi [*R.A.M.*, ix, p. 665]. In addition to the items already mentioned in Miss Doyer's paper, the following records are of interest. Seed disinfection of beans [*Phaseolus vulgaris*] with uspulun or germisan is usually ineffective against *Colletotrichum* [*lindemuthianum*], though it has proved useful in the case of *Macrosporium* [loc. cit.]. The latter organism causes the development of small orange-red spots near the micropyle and hilum, giving rise to the common German name of 'red nose'. 'Black heart' of peas, in which the interior of the seed is entirely black, is prevalent in the coastal region, where it may cause heavy damage, and has also been reported from England.

Hiltner's method of testing germinability by sowing the seed-grain in zinc boxes containing brick-dust is used for the determination of *Fusarium* in wheat. Where more than 15 to 25 per cent. of infection is present seed treatment is advisable, and where the incidence is above 35 per cent. this becomes essential.

Onion and leek seeds are examined for the presence of *Urocystis cepulae* which seems, however, to spread mainly through the soil. Germinating radish seeds are liable to infection by a species of *Alternaria* with sooty fructifications. *A. radicina* on carrot seed is readily destroyed by treatment with 0·25 per cent. uspulun or germisan, which does not impair germination. Cabbage seed is often infected by *A. brassicae* and occasionally by *Phoma oleracea* [*P. lingam*: ibid., vi, p. 329]. *Septoria apiicola* [*S. apii*] is nearly always found on celery seed [ibid., vi, p. 332], the treatment of which is advisable, though it may not prevent infection at a later stage. A *Phoma* may occasionally be detected on celery seed on microscopic examination [cf. ibid., vii, p. 285]. Black salsify

(*Scorzonera*) [*hispanica*] is subject to attack by *Botrytis cinerea* and *Sclerotinia* sp., which are amenable to disinfection as indicated above. Details are given of the methods employed in testing beet seed-clusters for the presence of *P. betae*.

GREGER (J.). **Über das Verhalten von Schimmelpilzen auf Expansionskork.** [On the behaviour of moulds on expansion cork.]—*Zeitschr. für Untersuch. Lebensmittel*, lx, 5, pp. 532–536, 1930.

The raw cork used for insulating purposes in cold storage rooms is liable to be permeated by moulds (*Penicillium*, *Mucor*, and *Aspergillus* spp.), which develop under favourable conditions and produce a disagreeable musty odour. Protracted exposure to hot air (above 100° C.) kills the spores and thus prevents the development of primary infection, but secondary infection (by *A. niger* in these experiments) may occur on cork that has been sterilized by exposure to temperatures from 100° to 250°. By raising the temperature to 260°, however, the cork may be thoroughly sterilized in ten minutes, after which the development of secondary infection is no longer possible.

GLENNIE (AGNES E.). **Index to the literature of food investigation.**—Published by Dept. Sci. & Indus. Res., Food Invest. Board, London, i, 1, iv+85 pp., 1929; i, 2, iv+154 pp., 1929; ii, 1, iv+108 pp., 1930; ii, 2, iv+89 pp., 1930.

These are the first four numbers of an annotated bibliography of current English and foreign publications useful to those interested in problems of food research which is issued at intervals by the Low Temperature Research Station, Cambridge. Sections are devoted to bacteriology and mycology, and the diseases of transit and storage of food products are included under each product. Each number (price 2*s.*) is obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, or through their agents or any bookseller.

BLATTNÝ (C.). **Poznámky o virových a příbuzných chorobách rostlin. I.** [Notes on virus and similar diseases of plants. I.]—*Ochrana Rostlin*, x, 4–5, pp. 130–138, 3 figs., 1930. [German summary.]

In this paper the author gives brief notes on the virus and similar diseases of cultivated and wild plants observed by him in Czecho-Slovakia, some of which, so far as he is aware, have not been previously recorded in that country. A somewhat fuller account is given of those diseases of wild plants which show points of analogy with similar troubles of cultivated crops, in view of the possibility that they may be eventually shown to be caused by one and the same virus. Amongst others the following may be mentioned.

A dwarfing caused by an undetermined virus was observed in a small number of garden lilies (*Lilium* sp.) and in wild *L. martagon* in central Bohemia in 1930. A similar condition of garden

lilies was also seen by the author in Germany. In 1929 escapes from cultures of garlic (*Allium sativum*) in central Moravia exhibited dwarfing and yellowing of the leaves. The flowers on the affected plants for the most part failed to develop or dried up before setting. Onion (*A. cepa*) yellows (known in Germany under the name of 'Rotzkrankheit') [*R.A.M.*, ix, p. 620] is considered to be a virus disease; it occurs sporadically in Czecho-Slovakia. The affected plants do not flower, and usually succumb to secondary organisms, such as bacteria, nematodes, and insects, some of which may serve as carriers of the disease. *Chenopodium album* exhibits three types of virus diseases, namely: (A) dot mosaic, characterized by light green specks over the whole of the leaf, which are most conspicuous in cool weather and in weak plants. The affected plants remain small and produce poor flowers. Attempts to transmit this mosaic to sugar beet gave negative results. (B) Mosaic variegation, characterized by elongated spots, passing from green through yellow to pure white, on the leaf blade and midrib. This disease does not affect either the growth or flower production of the plants. (C) Typical yellow vein mosaic, which causes the plants to remain dwarfed and without flowers. A typical vein mosaic was also observed in *Sambucus nigra*, characterized by a dark yellow discoloration of the veins: the diseased plants are dwarfed, flower poorly, and the flowers are often sterile. This disease, which occurs both in Czecho-Slovakia and in Germany, appears to be transmissible by *Aphis sambuci*. *Convolvulus arvensis* is also affected by a typical vein mosaic, in which the yellow discoloration of the veins may extend over the whole leaf. The diseased plants remain dwarfed and do not climb; the few flowers that are formed tend to dry up and the seed set by them does not ripen. Cultivated and a few wild varieties of gooseberry are affected with vein mosaic, the symptoms of which vary with the temperature. This disease was shown to pass from infected stocks to healthy grafts, and to be transmissible by aphids. In a series of experiments it was also transmitted in 3 per cent. of the trials by the larvae of *Nematus ventricosus*. Red and black currants, particularly the latter, suffer mostly from vein and diffuse types of mosaic, more rarely from aucuba mosaic; the affected plants have dwarfed shoots and are sterile. Raspberries and blackberries are affected by a number of virus diseases which frequently occur in combination [ibid., x, p. 78]. Cultivated and wild watercress (*Nasturtium officinale*) occasionally exhibits a vein-aucuba mosaic with a greenish-yellow discoloration. The diseased plants are dwarfed and produce few flowers. The transmissibility of this disease appears to be low. Violets (*Viola* sp.) in a garden in Prague showed a typical yellow aucuba mosaic; the affected plants had small leaves and were frequently sterile. A vein-aucuba mosaic was also frequent in *V. tricolor arvensis* in south Bohemia in 1930; the diseased plants were dwarfed and produced few or no flowers. Cultivated *Prunus insititia* damsons are affected with a typical yellowish-green vein mosaic, which occurs but rarely in trees escaped from culture. The growth of the affected trees is smaller than that of healthy ones, and they are sterile.

PITTMAN (H. A.). **Note on the morphology and endotrophic mycorrhiza of Rhizanthella gardneri, Rogers, and certain other Western Australian Orchids.**—*Journ. Roy. Soc. Western Australia*, xv, pp. 71–79, 3 pl., 1929. [Received February, 1931.]

The Western Australian orchid *Rhizanthella gardneri*, the vegetative portion of which is entirely subterranean, obtains its supplies of organic matter through a mycorrhizal fungus, no chlorophyll being found in any part of the plant. The distal end of the rhizome is covered with hairs having a long, cylindrical, filamentous, thin-walled, apical cell and a large, wart-like, multicellular base. Infection was observed to take place solely through these apical cells, in most of which parallel, infrequently branching, septate hyphae were present; in the cells at the base the hyphae become much branched (chiefly at a right angle) and tangled together. About ten layers of the ground tissue below the epidermis also contain the fungus, and in the innermost of these the hyphae become closely clumped together and form an amorphous, golden-brown, deeply staining mass to which the enlarged and deeply staining nuclei of the host cells were closely applied. The fungus was wholly intracellular and no vesicles or spore-like bodies were observed.

In all the *Caladenia* orchids examined (*C. flava*, *C. patersoni* var. *longicauda*, *C. gemmata*, and *C. sericea*) the outside of the underground stem showed numerous multicellular, wart-like hairs, most of which had several long, filamentous apical cells produced by the prolongation of the terminal cells. These hairs provided the sole means of ingress and egress for the mycorrhiza in the cells of the cortex. In all the material examined the fungus was in an amorphous condition in all the occupied cells except the hair cells.

An intracellular fungus was also present in the cortical region of the underground stem of the bird orchid, *Pterostylis turfosa*, the hyphae passing through the apical cells of wart-like hairs into the soil.

The roots of all the other orchids examined (*Prasophyllum fimbria*, *Diuris longifolia*, *Lyperanthus nigricans*, *Thelymitra crinita*, and *T. longifolia*) contained endotrophic and wholly intracellular mycorrhiza.

HALKET (A. C.). **The rootlets of 'Amyelon radicans', Will.; their anatomy, their apices and their endophytic fungus.**—*Ann. of Botany*, xliv, 176, pp. 865–905, 2 pl., 6 figs., 1930.

The author states that the microscopic examination of sections of the palaeozoic gymnospermous rootlets of *Amyelon radicans* (believed to belong, in all probability, to *Cordaites*) from calcareous nodules from the British Coal Measures showed these rootlets to be similar to the roots of many modern gymnosperms in anatomical structure, place of origin of the phellogen, origin of lateral branches, structure of root apex, and mode of growth; they were also found to contain an endophytic fungus similar to the endophytes present in the mycorrhiza of certain modern conifers and other plants. Although the cortex of the rootlets was not differentiated into distinct regions, a 'fungal zone' around the stele is

well marked inside the inner cortex. The hyphae of the fungus present in the latter were septate, indicating that the organism belonged to the Ascomycetes or Basidiomycetes, rather than to the Phycomycetes. For the most part the hyphae were apparently intercellular, but some of them appear to have been also intracellular. Structures were also found which are comparable to the 'vesicules' and 'arbuscules' characteristic of the endophytes of certain modern mycorrhiza [*R.A.M.*, vii, p. 798; ix, p. 541].

In discussing the physiological relations between the fungus and the roots of *A. radicans*, the author considers that they were of the same nature as those that exist between fungus and root in certain endotrophic mycorrhiza of the present day.

BARNES (B.). **Variations in Botrytis cinerea Pers., induced by the action of high temperatures.**—*Ann. of Botany*, xliv, 176, pp. 825–858, 1 pl., 5 figs., 1930.

The results of the work described and discussed at length in this paper showed that variations analogous to those previously described in *Eurotium herbariorum* [*R.A.M.*, viii, p. 192] can be induced in *Botrytis cinerea* by subjecting the conidia, prior to sowing, to the action of high temperatures. Of 520 inoculations with heated conidia of a strain of this fungus known to be stable in culture 424 gave no growth, 20 produced a growth indistinguishable from that of the controls, 64 yielded slight variations, and 12 gave rise to strongly modified colonies. The most striking variants were, however, observed in series of cultures from two original abnormal colonies which had developed, respectively, from only one and a few conidia that had survived the treatment. Four of these variants were maintained in culture for over two years and have retained their characters unchanged: the first produces many sclerotia with few conidia; the second and third form colonies of low, dense, white growth; and the fourth is characterized by the production of microconidia, which germinate readily. One culture of the fourth variant produced some white sclerotia, but no strain was observed which produced only white sclerotia. The early cultures of the unstable variants investigated were distinguished by rather weak growth, associated with the production of pinkish sclerotia in radiating groups; in one series pink mycelium and pink appressoria were also noted. These abnormal features slowly disappeared and the cultures reverted to the normal form, a process which seems to have been hastened by the hot weather in the summer of 1929. There was evidence of an association between the occurrence of pink pigmentation in the fungus and weakness of constitution. The nature of the pink pigment was not investigated owing to lack of sufficient material.

The paper terminates with a brief discussion of the normal pigmentation of *B. cinerea*.

WELCH (H.). **The effect of ultra violet light on molds, toxins and filtrates.**—*Journ. Prevent. Med.*, iv, 4, pp. 295–330, 2 figs., 1930.

Eleven strains of *Aspergillus*, 14 of *Penicillium*, and 11 of *Mucor* were exposed to radiation from a 'C' carbon lamp for

varying periods. The *Aspergillus* strains proved to be the most resistant, requiring up to four minutes' radiation for the total inhibition of growth, while *Penicillium* and *Mucor* were destroyed in two minutes and one minute, respectively.

DILLON WESTON (W. A. R.) & HALNAN (E. T.). **The fungicidal action of ultra-violet radiation.**—*Phytopath.*, xx, 12, pp. 959–965, 2 figs., 1930.

Potato agar cultures of *Mucor mucedo, Fusarium* sp., *Sclerotinia trifoliorum*, and *Stereum purpureum* in Petri dishes with vita or sanalux glass tops were exposed to the rays of a quartz mercury-vapour lamp for 9 minutes daily during 14 days. The mycelial growth of all the fungi was arrested, but in *Sclerotinia trifoliorum* sclerotia were observed to be forming at the end of the period of irradiation. As in Fulton's irradiation experiments [with *Penicillium italicum* and *P. digitatum*: *R.A.M.*, viii, p. 516], the darker-coloured spores proved more resistant to the action of the rays than the mycelium. The germination of the spores of *Tilletia caries* from Chinese White wheat, irradiated as described above for 9 minutes daily for a week, was also checked and few primary conidia were formed.

Further experiments with *Stereum purpureum*, in which two series of cultures were daily irradiated for a week, one at 12 and the other at 24 inches from the lamp, for 1, 2, 4, 8, 16, 32, and 64 minutes, respectively, showed that the fungicidal action of the rays varied with the time given and the distance from the lamp. The inference from the preliminary tests was that the mycelium had been killed by the rays, but it was subsequently found to have grown away from the light and deep into the medium—in some cases as far as the bottom of the dish. Similar results were obtained with *Sclerotinia trifoliorum*, the sclerotia of which, as in the earlier test, were produced at the side of the dish.

SCHWEIZER (G.). **Ein Beitrag zur Ätiologie und Therapie der Blattrollkrankheit bei der Kartoffelpflanze.** [A contribution to the etiology and cure of the leaf roll disease of the Potato plant.]—*Phytopath. Zeitschr.*, ii, 6, pp. 557–591, 16 figs., 1930.

For some years the writer has been engaged in studies on the etiology and cure of potato leaf roll [*R.A.M.*, vi, p. 370], which is stated to have long been the cause of excessively heavy losses in Germany.

Investigations on the carbohydrate metabolism of rolled leaves confirmed the view expressed by Schacht (*Ber. an das Kgl. Landesökonomiekoll. über die Kartoffelpflanze und deren Krankh.*) as long ago as 1854, namely, that the diseased foliage is characterized by a more copious accumulation of sugar in the form of glucose than that of healthy plants. This abnormal sugar accumulation extends to the tubers that develop from diseased mother plants, the effect, however, not being noticeable until the period of winter storage.

Chemical tests on dilute extracts from diseased mother tubers after one to three months in the soil showed that the proteins had all migrated to the shoots; this was not the case, however, with the reserve starch, the transport of which is evidently irregular.

No trace of nitrates was found in the mother tubers. The ash content of the leaves and stems of the diseased plants was very much higher than that of healthy ones.

Microchemical tests made on sections through the stems of diseased plants with necrosis of the phloem revealed the absence in the phloem strands of the oxidizing body named leptomin by Raciborski, which has been regarded as a peroxidase by other workers. Healthy plants may also fail to show the normal leptomin reaction when they reach a state of senescence [ibid., vii, p. 460], but this concomitant of 'obliteration' or 'senility necrosis' in the phloem is not a sequel to pathological conditions in the same sense as the acute phloem necroses, though both states may be referred to the same ultimate cause, viz., lack of carbohydrates and proteins. Degeneration phenomena in the phloem, accompanied by starch accumulation in the leaves, were experimentally induced in healthy *Helianthus tuberosus* and potato plants by the application of substances (e.g., tannins and traces of copper sulphate) tending to counteract the oxidation process and at the same time to eliminate the proteins. Microscopically and chemically these artificial 'pseudonecroses' are indistinguishable from the definitely pathological acute phloem necroses. By immersing bean (*Phaseolus vulgaris*) seeds before sowing in tannin solutions containing a trace of copper sulphate it was possible to induce rolling of the leaves, in conjunction with starch accumulation and pseudonecrosis, in the seedlings. Sections through material in which necrosis either occurred as a result of disease or was artificially induced showed, after lengthy exposure to diastatic action, a well-marked stratification of the membrane thickenings extending as far as the middle lamellae. This feature is regarded as of some importance, since it may point to a relation between necrosis and overproduction of the pectin substances of the cell membranes. The principal characteristics of acute phloem necroses, artificially induced necroses, and senility necroses (obliteration) are shown in tabular form.

Diseased tubers germinate later than healthy ones. After germination the proteins pass from the tuber to the young shoots much sooner than the carbohydrates. With the first check to the growth of the young plant, lasting from 6 to 10 days, diastatic activity ceases completely in the diseased tuber, presumably as a result of the premature migration of the reserve proteins to the shoot. The sudden shortage of proteins is further believed to be responsible for the development of the phloem necroses which are apparent as colourless or faintly brown areas in the first leaves of young plants from diseased tubers. Although the root system of diseased plants is poorly developed, there is a gradual accumulation of nitrates, assimilated from the roots, in the stems and leaves of affected plants during the second period of growth, together with a corresponding abundance of sugar and starch in the leaves. The progressive accumulation of these substances interferes with the normal growth of the plant and finally arrests it altogether. At this point the cylindrical rolling, gradual discoloration, and hardening of the foliage set in. During the growing period nitrates accumulate to such an extent in the leaves of diseased plants that

the nitrate content of these organs finally exceeds that of the stems. The vital functions of diseased plants are threatened by the reduction of the chlorophyll incidental, on the one hand, to the rapid consumption of the reserve proteins in the tubers, and on the other, to the excessive activity of the chloroplast protein in the leaves. This disturbed condition is expressed in the leaves of diseased plants by the development of a yellow discoloration; at this stage the injury is irrevocable and no longer amenable to the therapeutic influence of protein injections, which may restore normal activity to rolled leaves before they become discoloured. The minute quantities of organic nitrogen and carbohydrates found in the phloem of diseased plants throughout the growing period clearly indicate that these substances scarcely migrate from the leaves; hence the defective tuber formation associated with the trouble.

It is apparent from all these considerations that a close connexion exists between phloem necrosis and leaf roll, or rather deranged protein metabolism. The actual cause of the pathological conditions, however, remains obscure. The hypothesis that an ultramicroscopic virus is responsible appears irreconcilable with the therapeutic action of proteins. The metabolic disturbances described above must certainly be accompanied by other abnormal processes as yet undetected. In addition to the absence of a protective action of the proteins in relation to organic catalytic agents, there may be a simultaneous separation of inorganic catalysts leading to an antagonism of ions, some of which, particularly those producing electrolytic activity in normal plants, undergo immobilization.

Very promising results in the control of leaf roll were given by the application to the soil of a mixture of manganese, lime, cyanide, and uranium salts at the rate of 500 c.c. per plant, as well as by steeping the tubers for five minutes in the same solution, the latter (and more economical) method also being effective in one case against mosaic and crinkle.

BOTJES (J. O.). **Empfänglichkeit von Kartoffelsorten gegen Viruskrankheiten.** [Susceptibility of Potato varieties to virus diseases.]—*Landbouwkundige Tijdschr.*, xlii, p. 517, 1930. (Dutch.) [Abs. in *Fortschr. der Landw.*, vi, 5, p. 173, 1931.]

The writer's extensive investigations on the reaction of a large number of Dutch potato varieties to virus diseases failed to reveal complete immunity in any, though the same virus may produce quite different symptoms, or none at all, in different varieties; conversely, a similarity of symptoms in different varieties does not necessarily prove that the same virus is involved. A detailed account is given of top necrosis [*R.A.M.*, ix, p. 482].

WICK. **Ist das holländische Kartoffel-Anerkennungssystem für deutsche Verhältnisse erstrebenswert?** [Is the Dutch Potato certification system desirable under German conditions?]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, vii, 6, pp. 161–163, 1930.

The principles on which the Dutch and German potato certifica-

tion systems are respectively based are fully discussed and their efficacy compared [cf. *R.A.M.*, x, p. 48]. The conclusion reached is that each system is well adapted to its own country, but that any attempt to apply the Dutch regulations under the widely differing climatic and other conditions of Germany is undesirable.

LEMMERZAHL (J.). **Neues vereinfachtes Infektionsverfahren zur Prüfung von Kartoffelsorten auf Krebsfestigkeit.** [A new simplified method of inoculation for the testing of Potato varieties for freedom from wart disease.]—*Der Züchter*, ii, p. 288, 1930. [Abs. in *Fortschr. der Landw.*, vi, 5, p. 173, 1931.]

The writer has still further simplified the process of soil inoculation for the testing of potato varieties for immunity from wart disease [*Synchytrium endobioticum*: *R.A.M.*, ix, pp. 739, 802] in Germany. The main feature of the modification is the use of fresh zoospore suspensions, which are stated to give prompt and reliable results.

NEUMANN (H.). **Phytophthorabekämpfungsversuche.** [*Phytophthora* control experiments.]—*Oesterr. Zeitschr. für Kartoffelbau, 1930*, pp. 78–80, 1930.

Excellent control of late blight (*Phytophthora infestans*) on several standard potato varieties was given in Lower Austria and Styria in 1930 by two applications of 1 per cent. Bordeaux mixture (early July and beginning of August). Infection was completely checked and an increased yield of 9 per cent. was obtained. The results given by a commercial copper preparation known as kristallazurin were not satisfactory.

REDDICK (D.). **Frost-tolerant and blight-resistant Potatoes.**—*Phytopath.*, xx, 12, pp. 987–991, 1930.

Solanum demissum, an herbaceous perennial from Montevideo, was found to be immune from blight (*Phytophthora infestans*) at Ithaca, New York. The same character was exhibited by F_1 hybrids of this species with *S. maglia* and *S. fendlerii* [cf. *R.A.M.*, x, p. 53].

FISCHER (R.). **Glasige Kartoffeln.** [Glassy Potatoes.]—*Oesterr. Zeitschr. für Kartoffelbau, 1930*, 4, pp. 81–82, 1930.

The tubers of several standard potato varieties, e.g., Böhm's Allerfrüheste, Citrus, and Kipfler, of the 1930 harvest in Austria were characterized by a peculiar glazed appearance due to a reduction in the size and number of the starch grains [*R.A.M.*, ix, p. 126]. The glassy areas were most conspicuous at the distal end of the tuber. In some cases the distal ends suddenly started new growth as a result of a fresh intake of food material, the elongated, conical protuberances formed in this way being also deficient in starch and glassy in appearance. On cooking, the glassy portions turn into a slimy mass while the rest of the potato remains firm. The phenomenon is attributed to assimilatory disturbances consequent on cultivation in unsuitable environmental conditions.

FISCHER (R.). **Lagerkrankheiten der Kartoffel und ihre Verhütung.** [Storage diseases of the Potato and their prevention.]—*Oesterr. Zeitschr. für Kartoffelbau, 1930*, 4, pp. 72–77, 1930.

Directions are given in popular terms for the storage of potatoes under improved sanitary conditions in order to avoid the spread of infection due to wart disease (*Synchytrium endobioticum*), brown rot (*Phytophthora infestans*), white rot (*Fusarium* spp.), bacterial wet rot, and bacterial ring rot [*Bacterium sepedonicum*: *R.A.M.*, x, p. 51], all of which are prevalent in Austria.

THOMAS (K. M.). **A new Paddy disease in Madras.**—Reprinted from *Madras Agric. Journ.*, xix, 1, 3 pp., 1 pl., [received January, 1931.]

The second season rice crop in the Godavari Delta was seriously affected in March, 1930, by a disease not previously observed in Madras. When the seedlings are attacked in the nursery they grow pale and thin and die either before or after transplantation. In a mature crop the most characteristic external symptom is the sporadic appearance of tall, lanky tillers which come into 'shot blade' before the rest of the crop and bear pale green flags shooting up conspicuously above the general level. The average of 32 random measurements of the heights of normal and diseased plants was 2 ft. 6 in. and 3 ft. 3 in., respectively. The culms of the affected plants emerge from their sheaths, revealing the base of the internodes. The abnormal elongation of infected tillers appears to be due to an accelerated growth at the expense of lateral development and a premature effort at reproduction on the part of the plant. Such plants are invariably attacked at the collar region and die within two to six days. The leaves of diseased plants dry up one after the other from below, the margins first turning brown while a long strip on both sides of the midrib remains green for some time, after which it also turns brown and the leaf curls and droops. Another symptom of the disease is the development of adventitious roots from the first. second, and sometimes the third node above the ground level. The culms of infected tillers, when split open, show a distinct brown discoloration of the spongy tissue of the nodular region, the underground root system, however, remaining healthy. Some affected plants show externally a white or pink bloom of fungus growth at the lowest one or two nodes, this feature often being conspicuous on the dead sheaths. Eventually this growth develops into a pink incrustation consisting of a thick matting of mycelium bearing innumerable conidia. When pulled out the dead plants snap off at the collar.

McRae recorded a *Fusarium* on rice in Manipur, Gurdaspur, and near Pusa, causing the sterility of the grains and involving the entire failure of the crop [*R.A.M.*, vii, p. 303]. Later he isolated a *Cephalosporium* from rice in the Punjab which killed the seedlings and caused a collar rot of grown plants. The cultural characters of this organism agreed with those of the previous one except for the absence of macroconidia in the latter. Stray plants affected by a disease almost identical with the Godavari fungus were obtained by the writer from the Paddy Breeding Station,

Coimbatore, towards the end of 1930. The causal fungus has been observed to produce the *Fusarium* and the *Cephalosporium* types of spores, but unlike the Godavari strain, has a predominance of the former. Apart from minor differences, however, the fungus responsible for the disease in various localities appears to be identical and to be widely, though discontinuously, distributed in India.

The microconidia (*Cephalosporium*) are oblong, hyaline, unicellular, and measure 5 to 13 by 3 to 5 μ. The macroconidia (*Fusarium*) are hyaline but pink in mass, elliptical to fusiform, 2- to 5-celled, and measure 16 to 48 by 2·5 to 4 μ. Inoculations through wounds kill seedlings in all stages, and contact inoculations cause the death of seedlings and abnormal elongation of tillers in grown plants.

THOMAS (K. M.). **Some aspects of the control of blast disease of Paddy.**—Reprinted from *Madras Agric. Journ.*, xviii, 12, 9 pp., 2 pl., [received January, 1931.]

The causal organism of rice blast (*Piricularia oryzae*) is believed to be carried over from one season to the next by spores and hyphae, the former remaining viable at Coimbatore, Madras, for a period up to seven months, and the straw and stubble of a previously infected crop having been observed to contain mycelium capable of producing new crops of spores under favourable conditions [*R.A.M.*, x, p. 269]. Experience has shown that the disease recurs annually on susceptible varieties raised in previously infected fields. Once the disease gains a foothold on the crop, it spreads like wildfire over extensive areas, defying all attempts at direct control.

During 1925–6 16 varieties, differing widely in duration of growth and morphological characters, were grown in a rectangular plot, 120 by 60 ft., in the Central Farm wetlands, healthy single seedlings being planted six inches apart in equidistant rows one foot apart, each row representing a variety. The series was replicated five times. The outskirts of the test plot were planted 20 ft. deep on all sides with the highly susceptible Poombalai variety, which was inoculated by spraying the sterilized stalks and ears with a spore suspension during cloudy, drizzling weather in September. The method of estimating the loss caused by the disease consisted in the careful examination of the nodes, neck, and panicles of every tiller and striking the percentage of infected tillers per row of plants.

Generally speaking, the early maturing varieties showed a relatively lower percentage of infection, as would be expected from the fact that they come into flower when the spore bombardment is less intense. Among these may be mentioned Safeda (immune), Elanikadan, E.B. 24, P.S. 67, and Co. 1 (0·5, 0·1, 0·14, and 0·5 per cent. infection, respectively). There was, however, a wide range of variation in susceptibility among varieties of approximately equal duration, which may be attributed to an inherent capacity for resistance. The most susceptible varieties were Kaltai Sambalai, Sadathilai, Adt 1, Adt 2, and Korangu Samba (73, 75·3, 73·1, 78·2, and 73·5 per cent. infection, respectively). The Nellore Samba

and Sadai Samba varieties, both of long duration (155 and 147 days) showed only 13 and 24·2 per cent. infection, respectively.

During 1928–9 another trial was conducted with long duration varieties and departmental strains evolved from pure line selection. Korangu Samba replaced Poombalai as a highly susceptible variety for bulk planting on the outskirts and it was also planted in single rows between every varietal row in the plot. The results of this test were similar to those obtained in the previous one. The E.B. 24, Co. 1, and Co. 4 varieties remained healthy while the most heavily infected was A.E.B. 3. Detailed investigations on the incidence of the disease in the experimental plots showed that, in the great majority of infected tillers, the loss was due to the invasion of the lowest node of the panicle, popularly known as the 'neck' of the earhead. As a rule, therefore, the most resistant varieties are those with relatively narrow and reclining shot-blades, a long emergence of the ear (length of the flower stalk between the base of the shot-blade and the neck), and spreading panicles, all of which factors tend to reduce the chances of spore infection. Greater vegetative growth was found to increase susceptibility. An experiment on the effects of various manurial ingredients on the incidence of blast showed that susceptibility was induced by nitrogen, while potash and phosphoric acid exerted a slight inhibitory action on infection.

BEELEY (F.). **Mildew disease of Hevea.**—*Malayan Agric. Journ.*, xviii, 12, pp. 596–599, 1930.

After stating that in 1930 a long period of comparative drought provoked widespread and serious outbreaks of mildew of *Hevea* rubber (*Oidium heveae*) in Malaya [*R.A.M.*, x, p. 270], and describing the symptoms of the disease and the causal organism in popular terms, the author expresses the view that drought and mildew together slightly reduce the yield in winter and prolong the winter period of reduced yield to three or four months instead of the usual two. Control consists in making weekly applications of sulphur dust [ibid., x, p. 205] at the rate of 10 to 12 lb. per acre until refoliation is complete, the cost of a season's treatment being estimated at $5 [about 11*s*. 8*d*.] per acre. A duster of the Björklund motor type can effectively treat some 250 acres per day; for small plantations hand and foot machines are obtainable.

DIXON (DOROTHY). **The micro-organisms of the tertiary red sands near Melbourne, Victoria.**—*Australian Journ. Exper. Biol. & Med. Sci.*, vii, 4, pp. 161–169, 2 graphs, 1930.

During 1928 and 1929 the writer made an investigation of the micro-organisms occurring in soil samples of the tertiary red sands area lying to the north-east of Port Philip Bay, near Melbourne. As in the clay soils previously examined [*R.A.M.*, viii, p. 129] cultivation influenced the number of organisms in the tertiary sands, but whereas in the former it caused an increase, in the latter cultivation diminished the soil population. Of the 26 genera of fungi isolated, 13 were common to both the sandy and clay soils. As in the clay region, the uncultivated sandy soil contained

fewer Phycomycetes and a larger number of species of *Penicillium*, *Aspergillus*, and *Trichoderma* than the cultivated. The 13 genera newly isolated from the sandy soil samples were *Rhizopus*, *Syncephalastrum*, *Trichothecium*, *Corethropsis*, *Dematium*, *Hormodendrum*, *Acrothecium*, *Coniothecium*, *Nigrospora*, *Stemphylium*, *Phoma*, *Pleospora*, and *Coniothyrium*.

Bell (A. F.). **Work of the Division of Pathology.**—*Thirtieth Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 36–41, 1930.

After referring to the nine quarantine areas into which the Queensland sugar-cane belt has been divided [*R.A.M.*, ix, p. 809], the author states that an adequately isolated variety garden has now been established on an island in Moreton Bay, from which distributions of disease-free cane will be made. The collection will be restricted to varieties useful for commercial and breeding purposes; the land will also be used to propagate varieties released from quarantine and will serve as a source of supply for foreign exchanges. Isolation plots for the production of disease-free cane for planting purposes have also been established in the Cairns, Tully, and Bundaberg districts, the scheme in each area being operated by the local Farmers' Association under the supervision of the Queensland Bureau of Sugar Experiment Stations.

To produce varieties suitable for each of the three broad types of climate represented by the above-named districts and resistant to the important local diseases, all three stations now raise seedlings. As soon as possible promising seedlings will be tested for resistance to diseases locally prevalent, only those reaching a required standard being released for farm yield trials. It is hoped that by this means sugar-cane diseases will eventually be arrested directly they appear. The required standard of resistance to certain diseases is very high at present, but if necessary it could be lowered when the situation improves.

There is little doubt that P.O.J. 2714 (a full sister to P.O.J. 2878) is the most vigorous cane in Queensland, for which reason its cultivation is rapidly extending. It is, however, susceptible to all the major diseases [cf. ibid., viii, p. 809] except mosaic, including gumming [*Bacterium vascularum*: ibid., ix, pp. 203, 339], leaf scald [*Bact. albilineans*: loc. cit.], downy mildew or leaf stripe [*Sclerospora sacchari*: ibid., ix, p. 62], red rot [*Colletotrichum falcatum*: ibid., viii, p. 336], and red stripe or top rot [ibid., ix, p. 340], as well as to many minor diseases. The identity of top rot in Queensland with the red stripe of other countries due to *Phytomonas rubrilineans* [ibid., viii, p. 265] is now accepted. A top rot and stem decay without red streaking of the leaves is caused by the same organism entering wounds in the stem. The morphological and cultural characteristics of the causal organism agree closely with those of *P. rubrilineans*.

An extension of Fiji disease was reported from the Bundaberg area.

The resistance to gumming shown by the Coimbatore canes Co. 210, Co. 213, and Co. 227 [ibid., viii, p. 336] has been generally maintained, but Co. 213 appears to be less resistant than Co. 210

and is susceptible to mosaic; Co. 210 is usually resistant to mosaic, but when it contracts the disease it becomes severely affected.

DAVIS (R. L.). **Mayaguez 3, 7, and 42—three Cane varieties immune to mosaic.**—*Agric. Notes, Porto Rico Agric. Exper. Stat., Mayaguez*, 52, 2 pp., 1930. [Mimeographed.]

Specially promising results as regards resistance to mosaic and other desirable characters are stated to have been given by the new sugar-cane varieties, Mayaguez 3, 7, and 42, resulting from crosses between P.O.J. 2725 and S.C. 12/4 [*R.A.M.*, vii, p. 536]. Descriptive notes on each of the new canes are given.

CHARDON (C. E.) & TORO (R. A.). **Mycological explorations of Colombia.**—*Journ. Dept. Agric. Porto Rico*, xiv, 4, pp. 195–369, 6 pl., 13 figs., 1 map, 1930.

An attempt has been made to bring up to date the existing knowledge of the fungous flora of the Republic of Colombia, where the authors collected during the years 1926–29 [cf. *R.A.M.*, ix, p. 437]. The present paper comprises a review of the relevant literature, followed by a critical study, in collaboration with various specialists [whose names are given], on the material under consideration, and a preliminary host index. Altogether 384 species are reported, of which 248 were hitherto unknown, from Colombia, and 47 (including 3 from Panama) are new to science. The number of species previously known from Colombia was 362, so that the total number now recognized as occurring in that country is 610.

PETRAK (F.) & CIFERRI (R.). **Fungi dominicani.** [Dominican fungi.]—*Ann. Mycol.*, xxviii, 5–6, pp. 377–420, 1930.

This is a continuation of the descriptive list of Dominican fungi begun by the second-named author in collaboration with the late R. González Fragoso [*R.A.M.*, viii, pp. 200, 267]. In the present paper (containing over one hundred records) the following are of interest. *Asteromella gratissima* n. sp. produces on both surfaces of living and withered avocado (*Persea gratissima*) leaves irregularly scattered, round, elliptical, somewhat angular or irregular, confluent, yellow or leather-coloured, later greyish-brown spots, measuring 2 to 8 mm. in diameter, with raised, dark reddish-brown edges and generally surrounded by a broad band of grey or greenish-brown discoloured tissue. The fungus is characterized by depressed-spherical or broadly ellipsoidal, dark pycnidia, without an ostiole, 35 to 50 μ in diameter, and innumerable bacillary, non-septate, hyaline conidia measuring 2 to 3 μ in length and about 0·6 μ in thickness.

Dothiorella dominicana n. sp. forms (in conjunction with other fungi, e.g., *Pestalozzia* sp.) very large, irregular, yellow or leather-coloured, subsequently white or whitish-grey spots, sharply delimited by an undulating, somewhat raised, dirty purplish-brown margin on wilting mango leaves. The depressed-spherical, ostiolate pycnidia measure 180 to 200 μ in diameter (occasionally up to 250 μ), the irregularly spherical pore being 10 to 15 μ in width. The simple, rod-shaped conidiophores measure 5 to 10 by 2 to 2·5 μ,

and the non-septate, hyaline, elongated-fusiform or somewhat clavate, straight or slightly curved, tapering conidia, 13 to 22 by 5 to 7 μ.

Phomopsis caricae-papayae n. sp., found in association with a *Colletotrichum* and its perfect stage *Glomerella*, on dry *Carica papaya* stems, is characterized by depressed-spherical, elongated to broadly ellipsoidal, often somewhat irregular, ostiolate pycnidia, 150 to 280 μ in diameter, with a spherical pore 20 to 25 μ wide. The subhyaline or very pale yellowish-brown hyphae, 1·5 to 3·5 μ in thickness, form a loose stroma. The rod-shaped conidiophores, tapering towards the apex, measure 5 to 10 by 1 to 1·5 μ and bear abundant elongated-fusiform to clavate, straight or slightly curved, tapering, non-septate hyaline conidia, 5 to 8 (rarely up to 10) by 1·5 to 2·5 μ.

P. caryota-urentis n. sp., occurring on dry stems of *Caryota urens*, may be recognized by its depressed-ellipsoidal, ostiolate pycnidia, 200 to 350 by 150 to 250 μ, with an irregularly spherical pore 20 to 30 μ in width. The pale grey or olive-brown, later hyaline hyphae measure 1·5 to 2·5 μ in thickness; the simple, rod-shaped conidiophores, tapering towards the apex, measure 7 to 12 by 1·5 μ and bear innumerable elongated-fusiform or clavate, straight or very slightly curved, non-septate, hyaline, tapering conidia, 6 to 9·5 by 1·5 to 2·5 μ.

P. pisicola n. sp., found on dry pea stems, is characterized by depressed-spherical to broadly ellipsoid pycnidia, 120 to 200 μ in diameter, with a short cylindrical ostiole, 30 μ in height and up to 70 μ in width, and a spherical pore 20 to 25 μ wide. The thin-walled, subhyaline or pale olive-brown hyphae measure 2·5 to 3·5 μ in width; the rod-shaped conidiophores, tapering towards the apex, measure 5 to 8 (occasionally up to 10) by 1 to 1·5 μ and bear masses of elongated or subcylindrical, straight or somewhat asymmetrical, rarely slightly curved, non-septate, hyaline conidia, 5 to 7·5 by 1·5 to 2·5 μ.

Other records of interest in this list include *Meliola clavulata* on living leaves of *Ipomoea* sp.; *Melasmia acerina* on living leaves of cultivated *Acer* sp.; and *Septoria betae* on living leaves of beet [ibid., v, p. 699].

STEVENS (F. L.). **Parasitic fungi of British Guiana, Trinidad and Costa Rica.**—*Ann. Mycol.*, xxviii, 5–6, pp. 364–371, 1 fig., 1930.

Taxonomic notes are given on 38 species of parasitic fungi constituting part of a collection made by the author during 1922 in British Guiana, Trinidad, and Costa Rica [cf. *R.A.M.*, x, p. 129]. The list includes eleven new species (five of which belong to new genera) and two new varieties. *Colletotrichum catenulatum* n. sp., producing numerous dark spots on *Agave angustifolia marginata* in British Guiana, is characterized by innate, erumpent, discoid, dark acervuli, 200 to 300 μ in diameter, bearing many tapering, dark brown, 2- to 4-septate setae, mostly marginal, 80 to 100 μ long and 3 to 5 μ wide at the base; cylindrical conidiophores measuring 20 to 30 by 3 to 4 μ; and subhyaline to olivaceous,

continuous, irregularly ovoid, often catenulate conidia, 10 to 16 by 3 to 4 μ. The new species differs from *C. agaves* [ibid., x, p. 31] which forms pale spots and is furnished with non-catenulate conidia, 22 to 26 by 4 to 5 μ. *C. falcatum* is recorded on Sudan grass [*Andropogon sorghum* var. *sudanensis*].

SYDOW (H.). **Novae fungorum species. XX.** [New species of fungi. XX.]—*Ann. Mycol.*, xxviii, 5–6, pp. 432–447, 1930.

Latin and German diagnoses, with critical notes, are given on a number of new genera and species of fungi [cf. *R.A.M.*, vii, p. 672] among which may be mentioned *Pachysaccha eucalypti*, n. g., n. sp., a stromatic Ascomycete resembling in the structure of its fructifications the genus *Oligostroma*, on the leaves of *Eucalytus rostrata*, together with its imperfect stage *Phomachora eucalypti* n. sp.; and *Phlyctaeniella cryptica* parasitizing the perithecia of an undetermined Ascomycete on the leaves of *E. obliqua*, both collected by G. Samuel in South Australia.

SPARROW (F. K.). **The classification of Pythium.**—*Science*, N.S., lxxiii, 1880, pp. 41–42, 1931.

The reclassification of the genus *Pythium* proposed by Sideris [*R.A.M.*, ix, p. 561] is criticized because the entirely filamentous forms, e.g., *P. dictyosporum* and *P. afertile* are not separated from the lobulate forms represented by *P. aphanidermatum* and *P. arrhenomanes*, both being grouped together under Schroeter's genus *Nematosporangium*. As the name *Pythium* was, however, first applied by Pringsheim to the very species placed by Schroeter in his genus *Nematosporangium* (*P. monospermum*) [ibid., x, p. 211], the latter generic name becomes superfluous.

The following alternative classification is proposed. *Pythium*, characterized by a zoosporangium identical with the filamentous vegetative hyphae, consisting of a hyphal segment delimited by cross walls, the content being discharged through a hyphal branch into a vesicle formed at the apex of this structure; not proliferating; the discharged protoplasm entirely delimited into zoospores within the vesicle.

Rheosporangium, distinguished by a zoosporangium consisting of a subspherical portion or a series of more or less compacted, intercommunicating, lobulate elements cut off from the vegetative hyphae by septa, and a filamentous evacuation tube which arises from the basal portion and through which the content of the whole complex is discharged into the vesicle; not proliferating; the discharged protoplasm entirely delimited into zoospores within the vesicle.

Phytophthora or *Sphaerosporangium* n. g., characterized by a narrowly ovoid, spherical, or citriform zoosporangium, clearly distinguishable from the vegetative hyphae from which it arises and separated by a cross wall; renewed by proliferation or branching of various types; vesicle present or absent; zoospores sometimes clearly delimited within the sporangium and emerging fully formed.

SAWADA (K.). **On the systematic investigation of Phyllactinia in Formosa.**—*Formosa Dept. of Agric. Govt. Res. Inst. Rept.* 49, 102 pp., 7 pl., 1930. (Japanese.)

The author describes 9 new species of *Ovulariopsis* and 6 of *Phyllactinia* [*R.A.M.*, x, p. 273]. A full host index of the old species, *P. corylea*, is given in English (pp. 8–30), with localities by continents or countries and references to the literature, and a similar one for *Ovulariopsis* (pp. 30–31). The *Phyllactinia* on mulberry (*Morus* spp.) regarded as a variety of *P. suffulta* [*P. corylea*] by Hennings is raised to specific rank as *P. moricola* [ibid., x, p. 274].

A four-page bibliography is appended and the characters of the mycelium, haustoria, and spore forms are fully illustrated.

YOSHINAGA (T.) & HIRATSUKA (N.). **A list of Uredinales collected in the province of Tosa.**—*Bot. Mag.*, Tokyo, xliv, 528, pp. 627–667, 1930.

A list is given of 255 rusts collected in the province of Tosa, among which may be mentioned *Uromyces appendiculatus* [*R.A.M.*, x, p. 152] on *Phaseolus radiatus* var. *flexuosus* and *Vigna sesquipedalis*; *U. fabae* [ibid., vii, p. 558] on *Lathyrus maritimus*, peas, and *Vicia faba*; *Puccinia lactucae* on two varieties of *Lactuca dentata*; *Hemileia vastatrix* on *Gardenia florida*; *Phakopsora vitis* (of which *P. ampelopsidis* [ibid., viii, p. 268] is given as a synonym) on *Ampelopsis heterophylla* and *Parthenocissus tricuspidata*; *Chrysomyxa rhododendri* on *Rhododendron kaempferi* [ibid., viii, p. 649]; and *Aecidium mori* on mulberry (*Morus alba*) [ibid., viii, p. 156].

A bibliography of 41 titles is appended.

CUNNINGHAM (G. H.). **Terminology of the spore forms and associated structures of the rust fungi.**—*New Zealand Journ. of Sci. and Tech.*, xii, 2, pp. 123–128, 1930.

The terminology of the reproductive bodies of the rust fungi being in need of standardization, the author suggests a revision of the ambiguous or erroneous terms in current employment on the basis of the following dicta: (1) that the sorial nature of the fruiting structures be indicated by the termination 'sorus'; (2) that terms be applied primarily on a morphological, not a cytological or functional basis; (3) that terminations be uniform throughout; (4) that precedence be given to terms in general use unless these are ambiguous or misleading; (5) and that equivocal terms be replaced by others with a precise meaning and, if possible, a modern interpretation [cf. *R.A.M.*, ix, p. 345].

On this basis 'pycniosorus', 'pycniospore', 'aecidiosorus', 'aecidiospore', 'caeomosorus', 'caeomospore', 'uredosorus', 'uredospore', 'teleutosorus', 'teleutospore', 'basidium', and 'basidiospore' are suggested. Reasons are indicated for the proposed changes [which are clearly set forth in a table].

MOESZ (G. v.). **Neue Pilze aus Lettland.** [New fungi from Latvia.]—*Magyar Bot. Lapok*, xxix, pp. 35–38, 4 figs., 1930.

Latin diagnoses are given of the following new species of fungi

collected in Latvia by the author and J. Smarods. *Diplodina lini*, isolated from the base of flax stems, is characterized by globose-depressed, light brown pycnidia, 100 to 225 μ in diameter, 87 to 100 μ in height, with a pore 12 μ in diameter, and ellipsoid, hyaline, uniseptate conidia 4 to 10 by 2·5 to 4 μ.

Hendersonia sorbi produces brown spots, 1 to 5 mm. in diameter, on both surfaces of living leaves of *Sorbus* [*Pyrus*] *aucuparia*. The black, globose pycnidia measure 62 to 375 μ in diameter, and the fusoid, straight or slightly curved, bi- to triseptate, light yellowish-brown conidia, tapering at both ends, 7·5 to 12·5 by 2·5 μ.

Ramularia coriandri forms scattered brown spots on living leaves and stems of *Coriandrum sativum*. The hyaline, simple, erect, cylindrical conidiophores measure 12 to 18 by 2·5 to 3 μ. The hyaline conidia are of three distinct types, viz., continuous, ovoid or clavate, 6·5 to 10 by 3 to 4 μ; fusoid, straight or slightly curved, uni- to biseptate; and fusoid-cylindrical, bi- to triseptate, 10 to 35 by 3·5 to 5 μ or occasionally up to 6 μ. In the variability of its conidia this species resembles *R. heraclei* from the United States, differing from the latter, however, in the length of the conidiophores.

Septoria smarodsii produces minute, round or slightly angular, yellowish to white spots on both surfaces of the leaves of *Amaranthus ascendens*. The pycnidia in the centre of the spots are black, globular or subdepressed, 55 to 112 μ in diameter, with a brown pore 13 to 15 μ in diameter; the acicular, straight or slightly curved, hyaline conidia measure 20 to 25 by 1·5 μ.

Stagonospora ophioboli, found parasitizing the perithecia of *Ophiobolus* sp. on dead stems of *Galium* sp., is characterized by globular or subconoid, yellow pycnidia, 62 to 125 μ in diameter, papilliform conidiophores, and cylindrical, straight, hyaline, biseptate conidia, 10 to 15 by 2·5 to 3 μ.

GOTO (K.). **On the perfect stage of Sclerotium rolfsii Sacc. produced on culture media. Preliminary report.**—*Journ. Soc. Trop. Agric.*, ii, pp. 165–175, 5 figs., 1930. [Japanese summary.]

A detailed account is given of the writer's investigations on 17 strains of *Sclerotium rolfsii* isolated from various hosts [which are listed] at Taihoku, Formosa, Japan [cf. *R.A.M.*, ix, p. 613].

On an onion agar medium at room temperature the mycelial mass is generally snow-white and lustrous when young, becoming dull with age. Both in nature and in culture the fungus forms fan-shaped strands which consist of two types of hyphae, one straight, with broad, elongated cells (60 to 100 by 5 to 7 μ) with a clamp-connexion across a septum or pairs of such connexions on either side, sometimes giving rise to new branches; the other is much narrower (1·5 to 2·5 μ in width) and irregular. The sclerotia are white at first, later chestnut-brown, generally spherical and smooth, 0·6 to 1·5 mm. in diameter, sometimes larger and irregular in culture. The periphery of the sclerotia consists of pseudoparenchyma, the outer layers composed of flattened cells with brown walls, and the innermost of prosoplectenchyma. The fruiting

bodies produced on onion agar in isolations from *Allium fistulosum*, *Colocasia antiquorum*, *Cosmos bipinnatus*, jute (*Corchorus capsularis*), papaw, *Sesbania sesban*, and sugar-cane are flattened, resupinate, usually rather loosely formed and confluent; in the case of naturally infected clover (*Trifolium repens*), however, they are somewhat leathery. In some strains these structures assume a dendroid form attached to aerial hyphae, while in others, e.g., from *A. fistulosum* and *S. sesban*, they are apt to simulate a powdery mildew. The subhymenial layer is composed of loosely interwoven hyphae (1·5 to 2·2 μ); the hymenium is also loose and inseparable. The hyaline, clavate basidia may bear two to four acicular, tapering sterigmata, but many of the basidia do not produce sterigmata; the hyaline, smooth-walled spores are obovate or slightly cylindrical, flattened at the inner side and apiculated at the base. The measurements of three strains (from sugar-cane, *S. sesban*, and jute, respectively), are as follows: basidia $27{\cdot}61 \pm 3{\cdot}74$ by $5{\cdot}90 \pm 0{\cdot}49$ μ, $32{\cdot}85 \pm 5{\cdot}49$ by $5{\cdot}61 \pm 0{\cdot}51$, and $21{\cdot}83 \pm 0{\cdot}88$ by $5{\cdot}88 \pm 0{\cdot}43$ μ; sterigmata $4{\cdot}85 \pm 0{\cdot}63$ by $1{\cdot}45 \pm 0{\cdot}14$ μ, $5{\cdot}50 \pm 0{\cdot}77$ by $1{\cdot}44 \pm 0{\cdot}01$, and $4{\cdot}52 \pm 0{\cdot}57$ by $1{\cdot}54 \pm 0{\cdot}15$ μ; basidiospores $7{\cdot}17 \pm 0{\cdot}63$ by $4{\cdot}80 \pm 0{\cdot}12$, $8{\cdot}42 \pm 0{\cdot}95$ by $5{\cdot}02 \pm 0{\cdot}75$, and $7{\cdot}15 \pm 0{\cdot}72$ by $4{\cdot}55 \pm 0{\cdot}42$ μ.

It is inferred from these data that all the above-mentioned strains belong to the single species *S. rolfsii*. Discussing the taxonomy of the perfect stage the writer concludes that it should be provisionally referred to *Corticium centrifugum* [cf. ibid., vi, p. 56].

TUNSTALL (A. C.). **Some notes on the treatment of blights.**—*Quart. Journ. Indian Tea Assoc., 1930*, 4, pp. 191–196, 1930.

Popular notes are given on the treatment of a number of tea diseases occurring in India [cf. *R.A.M.*, ix, p. 68]. Some of these, e.g., brown blight (*Glomerella cingulata*), grey blight (*Pestalozzia theae*), red rust (*Cephaleuros* spp.), *Diplodia* or tired area disease (*Thyridaria tarda* and *Diplodia* spp.) [ibid., ix, p. 746], and violet root rot (*Sphaerostilbe repens*), merely require resting and judicious manuring, supplemented where necessary by repeated spraying with lime-sulphur. The latter treatment is also effective against black rot (*Corticium invisum* and *C. theae*) [ibid., vii, p. 746] and thread blight [ibid., iv, p. 67]. The common root diseases, such as brown root rot (*Fomes lamaoensis*) and charcoal stump rot (*Ustulina zonata*), should be treated by the removal of infected bushes and of apparently healthy ones in their immediate vicinity. In the case of infection of the woody branches by *Nectria cinnabarina*, *Macrophoma theicola*, and similar organisms, the diseased portions should be excised.

ERISTAVI (E. M.) & MORDVINTZEFF (A. I.). **Краткий обзор болезней растений в Абхазии в 1929 г.** [A brief survey of plant diseases in Abkhasia in 1929.]—*Publications Agric. Exper. Stat. of Abkhasia*, Sukhum, 41, 20 pp., 6 figs., 5 graphs, 1930. [English summary.]

Very brief notes are given on some common diseases of cultivated plants observed in 1929 in Abkhasia [Caucasian littoral of the

Black Sea] and listed under the names of the hosts. Tobacco diseases are dealt with in greater detail in a special section, and include mosaic, white leaf spot (believed to be caused by a virus), wildfire (*Bacterium tabacum*) [*R.A.M.*, x, p. 132], a uniform brown spot and a brown spot with a white centre on the leaves caused by undetermined bacteria, black root rot (*Thielaviopsis basicola*) [ibid., x, p. 135], a wilt of seedlings and adult plants caused by *Fusarium oxysporum*, and a seedling rot caused by *Pythium perniciosum* Gobi. The last-named disease made its appearance at the beginning of June in several localities and was particularly severe in the tobacco nursery of the Abkhasian Experiment Station, where entire seed-beds were wiped out by it; in one locality it was also observed in tobacco plants planted out in the field. *P. perniciosum* differs from *P. de Baryanum* in the larger size of its oospores (25·8 to 30 μ) and in the wider diameter of its hyphae (4·5 to 9 μ).

MES (MARGARETHA). **Physiological disease symptoms of Tobacco.** —*Phytopath. Zeitschr.*, ii, 6, pp. 593–614, 6 figs., 1930.

This is a condensed account of the writer's investigations during 1928–9 at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, Holland, on the etiology of various physiological diseases of tobacco, which have already been noticed from another source [*R.A.M.*, ix, p. 414].

BREWER (P. H.), KRAYBILL (H. R.), SAMSON (R. W.), & GARDNER (M. W.). **Purification and certain properties of the virus of typical Tomato mosaic.**—*Phytopath.*, xx, 12, pp. 943–950, 1930.

Continuing their experiments on the purification of the virus of tomato mosaic, the technique of which has already been described [*R.A.M.*, viii, p. 410], the writers found that the clear, colourless virus suspensions were still active after passage through Pasteur-Chamberland F filters and Schleicher and Shüll 1½ per cent. collodion filters; their virulence was lost, however, after passage through an atmometer cylinder, a Pasteur-Chamberland B filter, Schleicher and Shüll 3, 4½, 6, and 7½ per cent. collodion filters, and 2, 3, and 5 per cent. collodion filters precipitated from solution in equal parts of alcohol and ether. The wash water from the upper surface of used collodion filters was infectious.

Virus suspensions stored in a refrigerator without a preservative generally proved to be infectious after 6 to 20 months. They were inactivated by short exposures (10 minutes) to a temperature of 88° C. and by longer ones (25 minutes) to 82° to 84°. The hydrogen-ion concentration of the purified virus suspensions usually ranged from P_H 5 to 6·5. The virus was not inactivated by an increase of the acidity to P_H 2·46, but when the alkalinity was raised to P_H 7·5 to 8·5, a precipitate was formed and virulence was lost until acidity was restored.

Preliminary cataphoresis tests showed a tendency on the part of the virus to be carried to the positive pole, whence it would appear

that the infective principle or virus-bearing particles are negatively charged [ibid., ix, p. 540].

CHRISTOFF (A.). Бактерийната болесть по Черницата въ България. [The Mulberry bacterial blight in Bulgaria.]—*Земледѣлска Мисъль* [*Agricultural Thought*], Sofia, i, 2, pp. 193–220, 5 figs., 1930. [English summary.]

After giving a brief review of the literature dealing with bacterial blight of the mulberry (*Bacterium mori*) [*R.A.M.*, iv, p. 73; vii, p. 550] and indicating its distribution in different parts of the world, the author states that in Bulgaria the disease was first recorded in 1904 and has since steadily gained ground so that it is now known to occur in practically all the mulberry-growing areas of the country. The chief menace presented by it to the expanding sericultural industry is the fact that a large proportion of the existing mulberry nurseries have become more or less severely infected.

A description is given of the external symptoms and histological lesions caused by *Bact. mori* [a morphological, cultural, and biochemical description of which is also included] in the host. Although the organism may gain access to the host tissues through wounds in the bark of young shoots and through stomata, it is believed that in nature the most common mode of infection is through broken-off trichomes, particularly on the upper side of the leaves; this hypothesis was confirmed in experiments, in which leaves with their hairs cut off were sprayed with a suspension of the bacterium, with the result that the latter was found developing in large numbers in the underlying leaf tissue, which was killed. The experiments also showed that the incubation period of the disease is from 20 to 25 days in the lignified shoots, three or four days in the growing points, and two to six days in the leaves.

Bact. mori attacks both the white and the black species of mulberry [*Morus alba* and *M. nigra*], but there was ample evidence of varietal differences in susceptibility in both species; so far, however, no systematic study has been made of the varieties which show marked resistance in Bulgaria. The paper terminates with an indication of the control measures recommended by other workers, but stress is laid on the necessity of cutting back all diseased branches in the orchards, and on a strict sanitation of the latter and especially of mulberry nurseries.

SLATE (G. L.). **Filberts.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 588, 32 pp., 3 figs., 1930.

Popular notes are given (pp. 12–13) on bacterial blight of filberts (*Corylus avellana*) [*R.A.M.*, iv, p. 71] and eastern hazel blight (*Cryptosporella anomala*) [ibid., iii, p. 240]. The latter is stated to have been very destructive to filberts in the eastern United States, where it also attacks the common hazel (*Corylus americana*) in a milder form. The disease is characterized by the formation of rough oval warts, a quarter to a third of an inch long, followed by shrinking and death of the affected branches. Unless infection is arrested by the excision and burning of diseased material, the entire tree is destroyed in two or three years.

BRILL (O.). **Vorschläge zur Bekämpfung des Ulmensterbens.** [Suggestions for the control of the die-back of Elms.]—*Gartenwelt*, xxxiv, 48, pp. 658–660; 50, pp. 690–691, 4 figs., 1930.

In the writer's opinion the sole hope of arresting the progress of the devastating die-back of elms caused by *Graphium ulmi* (in conjunction with the sap beetle, *Scolytus scolytus*, and *Nectria cinnabarina*) is the immediate adoption of legislative measures throughout Germany [*R.A.M.*, x, p. 138]. The symptoms of the disease are stated to be recognizable in the early stages with certainty only on trees that have been drastically cut back, a process which temporarily restores the erect habit of growth peculiar to young elms; the typical distortions and discoloration due to *G. ulmi* are then plainly discernible. It is essential, therefore, that all elms in public and private grounds should be subjected to this treatment during the winter, and all those showing the least trace of discoloration removed and burnt before 31st May at the latest.

The writer's investigations have shown that *G. ulmi* first spreads from the top of the tree downwards through the main axis, the lateral branches not being attacked until the third year after infection. Thus trees showing no external trace of die-back may act as centres of infection for at least two summers.

The swarming period of *Scolytus* beetles has been found to extend from about the end of May to the beginning of August, during which time the transmission of the disease must take place.

KÖTHER (H.). **Das Ulmensterben geht weiter.** [The die-back of Elms spreads further.]—*Gartenwelt*, xxxiv, 51, p. 702, 1931.

Every autumn and winter for some years past numbers of elms in the Ruhr district of Germany are felled on account of die-back [*Graphium ulmi*: see preceding abstract], which occurred during 1930 with unparalleled severity. It is estimated that about 1,000 trees are affected in the northern part of the industrial region under observation, and the disease is further reported to have spread to Denmark and Sweden. Many experts are said to be of opinion that the degeneration of the elm, due to vegetative methods of propagation, presents an insuperable obstacle to the elimination of the disease.

VERRALL (A. F.). **Die-back of Elm in Minnesota.**—*Phytopath.*, xx, 12, pp. 1004–1005, 1930.

During the last two years elms in Minnesota (chiefly nursery stock 10 to 15 ft. in height) have suffered extensively from die-back, which has been found on 25 to 50 per cent. of the larger trees in some establishments. The fungus isolated from diseased material is characterized in culture by groups of abortive pycnidia borne in stromata and containing minute, elongated, hyaline spores, which point to its inclusion in the Sphaeroidales, possibly near *Cytosporella*. It appears to enter through the tips of the branches, working downwards through the wood and bark until the roots are reached. In one shade tree at St. Paul the fungus had reached the roots and killed the entire tree the second season

after the first wilting was observed. The path of the organism through the wood is marked by brownish streaks occurring either in a definite ring, as with *Graphium ulmi* [see preceding abstracts], or more often diffused throughout the wood. Finally the cambium and phloem are invaded and killed, the death of the tissues sometimes being preceded by the formation of reddish, sunken cankers.

Inoculation experiments with fragments of mycelium from agar cultures caused practically no damage on vigorously growing trees, but those transplanted from the field to the greenhouse succumbed in three months to the effects of inoculation. The stems were girdled at the point of inoculation and discoloured for 5 to 30 cm. round the wound. The above-mentioned fungus was reisolated from the diseased areas.

SCHREINER (E. J.). **The rôle of disease in the growing of Poplar.** —*Journ. of Forestry*, xxix, 1, pp. 79–82, 1931.

The most serious disease of poplars in New England is stated to be the canker caused by *Cytospora chrysosperma* [*R.A.M.*, ix, p. 432], the pycnidial stage of *Valsa sordida*. The mycelium grows in the bark of the tree, causing the death of the cambium. Small stems and twigs are killed by girdling without any sign of cankers, but where larger branches are invaded the dead areas are usually sunken. Numerous sucker shoots often develop immediately below a canker on a large branch or on the trunk, many of them soon becoming diseased and dying. Successive crops of such shoots may start each year until the tree has been killed. The pycnidia of the fungus extrude, during damp weather, yellowish-orange tendrils or globular masses of spores. Ordinarily the fungus is only weakly parasitic, living saprophytically on dead twigs or entering the tree through wounds.

Observations on seedlings of various native species of poplar, e.g., *Populus tremuloides*, *P. grandidentata*, *P. tacamahacca*, and *P. balsamifera virginiana*, have shown that individuals vary considerably in their reaction to *C. chrysosperma*, infection being generally most severe on trees making poor growth on unfavourable sites. Similar observations were made on clones of *P. eugenei*, *P. regenerata*, and *P. generosa*, all of hybrid origin. It would appear, therefore, that a direct relationship exists between the vigour of individual trees and their capacity for resistance to canker. It was shown by an experiment that one-year-old diseased *P. eugenei* trees, transferred from poor soil to a rich garden site, made vigorous growth and completely overcame the effects of attack by *C. chrysosperma*, while others left in the original soil succumbed to the infection.

Poplar cuttings kept in storage during the winter are very liable to infection by *C. chrysosperma*, which in one case is known to have reduced the number of living sets obtained from an autumn consignment of 10,000 to 20 or 30. Generally speaking, however, the fungus does not appear to be a very damaging factor in wild poplar stands in Maine, where the heaviest infection usually occurs on eight- to ten-year-old trees. In stands over 20 ft. high the injury from this source is seldom of importance. Proper storage of the cuttings at a temperature below 35° F. and the removal of

all those that are diseased have been found to reduce the subsequent development of the disease in the nursery.

HIRT (R. R.). **Fomes everhartii associated with the production of sterile rimose bodies on Fagus grandiflora.**—*Mycologia*, xxii, 6, pp. 310–311, 1 pl., 1930.

The author states that a beech tree (*Fagus grandiflora*) about 75 years old at Warrensburg, New York, was found in 1929 to bear a large number of sterile, rimose fruit bodies of the type that is commonly attributed to *Fomes igniarius* [cf. *R.A.M.*, viii, p. 345 and next abstract], and which were associated with a white heart rot similar to that caused by *F. igniarius*. One of the larger of these bodies, however, developed a normal sporophore which produced spores in abundance, and which was identified as *F. everhartii* [ibid., v, p. 265]. This fungus is stated to be rare in the Adirondacks, and this is, so far as the author is aware, the first record of its association with the production of sterile fruit bodies on the beech.

ULBRICH (E.). **Über Alter, Dickenwachstum und Fomes-Befall einer Rotbuche (Fagus silvatica L.) am Faulen Ort in der Gramzower Forst.** [On the age, growth in diameter, and *Fomes* infection of a Beech (*Fagus silvatica* L.) at the 'Fauler Ort' in the Gramzow forest.]—*Verh. Bot. Vereins Prov. Brandenburg*, lxxii, 2, pp. 109–113, 1930.

During an excursion in the Gramzow forest, Uckermark, Brandenburg, in June, 1929, the writer observed heavy infection by *Fomes fomentarius* and *F. igniarius* on an approximately 280-year-old beech [*R.A.M.*, ix, p. 499]. Infection by *F. fomentarius* (the chief invader) apparently took place about 1860, when the tree was roughly 210 years old. The fungus attacked the trunk from the west and north, the wood on the side facing east being healthy. The sapwood on the west side is badly decayed and externally brittle, except for two 'islands' of dark, healthy wood in close proximity to the cambium; from these areas narrow, zigzag strips of healthy wood penetrate far into the rotten portion. According to Dr. Liese, this phenomenon is due to the formation of so-called 'defence zones' at the juncture of two or more different mycelia of the fungus. The heartwood is red and mostly healthy, except on the west side where the decay extends almost to the medulla. Altogether the affected area presents a map-like aspect. The dirty white mycelium of *F. fomentarius*, of a coarse papery texture, is particularly conspicuous along the medullary rays and in the frost cracks running in the same direction. The fruit bodies of both fungi are very similar.

Government of Bengal. Sixty-seventh Annual Report of the Government Cinchona Plantations and Factory in Bengal for the year 1929–30.—25 pp., Calcutta, Bengal Secretariat Book Depot, 1930.

In the nurseries of the Munsong cinchona plantations [Sikkim Himalaya] an obscure epidemic has caused heavy damage to the

seedlings for some years past and is still prevalent, interfering to a considerable extent with the normal planting programme [cf. *R.A.M.*, ix, p. 431]. Experiments in soil disinfection have not yet given conclusive results. Mildly infected plants appear to overcome the disease once they are transplanted in the open, and possibly their early removal from the nursery may solve a problem which is stated to be of immense importance throughout the quinine-growing area of Sikkim. The disease has also been observed in a less virulent form on older plants in the Mungpoo district.

LIESE [J.]. **Der Kienzopf auf der Choriner Provenienzfläche. (Beitrag zum vorhergehenden Artikel von Herrn Prof. Dr. Wiedemann.)** [Resin top in the area supplied with seed from Chorin. (A contribution to the preceding article by Prof. Dr. Wiedemann).]—*Zeitschr. für Forst- u. Jagdwesen*, lxii, 12, pp. 836–838, 1930.

Further details are given of the writer's observations on resin top (*Peridermium pini*) of Scotch firs [*Pinus sylvestris*] in north-east Germany [*R.A.M.*, ix, p. 691] in connexion with a paper by E. Wiedemann entitled 'Experiments on the influence of the origin of Pine seed' (*Zeitschr. für Forst- und Jagdwesen*, lxii, 7–8, pp. 498–522; 12, pp. 809–836, 5 graphs, 2 diags., 1930). It was found that trees originating in the south of France were most severely attacked, those from Scotch seed somewhat less so; moderate infection occurred on trees from Brandenburg, while those raised from seed procured from other localities were practically free from resin top. The examination in 1929 of a considerable number of trees inoculated with aecidiospores of *P. pini* from various sources in 1926 showed that there were also considerable individual variations in inherent susceptibility to resin top.

Mitteilungen der forstwissenschaftlichen Arbeiten der Forstlichen Versuchsanstalt Finnlands. XV. [Notes on the silvicultural activities of the Finnish Forestry Experiment Station. XV.]—Helsingfors, 1930. [Abs. in *Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xli, 2, p. 81, 1930.]

This volume of researches issued by the Finnish Forestry Experiment Station contains a note by M. Hertz on the development and effects of resin top of pine (*Cronartium* [*Peridermium*] *pini*) [see preceding abstract], which is stated to be found only on the pine, without an alternate host, in Finland. Statistical data are given on the radial, peripheral, and vertical progression of the fungus.

RILEY (J. E.). **White Pine blister rust control in Connecticut.**—*Connecticut Agric. Exper. Stat. Bull.* 314, pp. 453–477, 8 figs., 1 map, 1930.

Notes are given on the origin, life-history, and control of white pine blister rust (*Cronartium ribicola*), with special reference to the work of currant eradication in Connecticut [see next abstracts].

Investigations in the north-eastern States as a whole show that on numerous plots the incidence of infection occurring over periods of 5 to 15 years ranges from 50 to 95 per cent. of the total number of trees in the stands.

During the period from 1919–29, inclusive, approximately 219,000 acres of pine have been cleared from wild *Ribes* in Connecticut and 22,700 acres worked over a second time. Over 1,700,000 wild, and some 17,300 cultivated currant and gooseberry bushes have been destroyed. The average cost of the work over the 11-year period is 31 cents. per acre and the average number of bushes destroyed to the acre 7·77.

RILEY (J. E.). **European Black Currants outlawed.**—*Connecticut Agric. Exper. Stat. Circ.* 69, pp. ix–xi, 1930.

Under Chapter 172 of the Public Acts of 1929 (effective as from 1st July, 1929), any person who shall grow, plant, propagate, cultivate, sell, transport, or possess any plant, root, or cutting of the European black currant (*Ribes nigrum*) in Connecticut shall be fined not less than $25. The Director of the Connecticut Agricultural Experiment Station is authorized to seize and destroy any such plants, roots, or cuttings found within the State. Brief popular notes are given on the white pine blister rust [*Cronartium ribicola*: see preceding and next abstracts], against which these regulations are directed.

Quarantine and other official announcements April 1 to June 30, 1930. Announcements relating to White-Pine blister-rust quarantine (No. 63). Revision of regulations.—*U.S. Dept. of Agric. Plant Quarantine and Control Admin., Service and Regulatory Announcements April–June, 1930*, pp. 50–58, 1930.

This revision of the regulations concerning white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, vii, p. 815] is issued primarily to extend the list of States and counties infected by the rust to include Montana and those parts of Oregon not heretofore so designated. Other important changes include (1) the extension of restrictions on the movement of currant and gooseberry plants to cover leaves of those plants (including, in addition to cultivated red and white currants, the mountain currant *R. alpinum*); (2) the removal of the requirement of State inspection and certification in respect of white pine Christmas trees without roots and branches moved during November and December from non-infected States when such movement does not involve passing westward across the Mississippi Valley quarantine line; (3) the removal of certain special sanitation requirements so far as they applied to the shipment of 5-leafed pines from New York to the New England States and vice versa; (4) provision for the separate inspection and certification of independent units of nurseries which grow and ship 5-leafed pines under certain specified nursery sanitation provisions; and (5) a requirement that 5-leafed pines shall not be moved from Oregon or Idaho unless they have been raised from seed under the sanitation requirements heretofore prescribed for consignments from Washington and certain other generally infected States.

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RILEY (J. E.). **Nursery sanitation zones. White Pine blister rust control.**—*Connecticut Agric. Exper. Stat. Circ.* 70, pp. xiii–xxiv, 10 diags., 1 map, 1930.

Details are given concerning the present position of white pine blister rust (*Cronartium ribicola*) in Connecticut [*R.A.M.*, x, p. 352] in connexion with the establishment of nursery sanitation zones to prevent the spread of infection (Quarantine No. 17).

SNELL (W. H.). **Forest damage and the White Pine blister rust.**—*Journ. of Forestry*, xxix, 1, pp. 68–78, 1 graph, 1931.

The customary method of expressing loss or damage from blister rust [*Cronartium ribicola*: see preceding abstract] in the white pine [*Pinus strobus*] stands of the Adirondack Mountains in terms of infection percentages having proved both inadequate and unscientific [*R.A.M.*, viii, p. 617], the author now works upon a plan based on the following factors: (1) accumulation of infection and mortality data in standardized note form taken from the trees; (2) mapping of the plot, with accurate placing and symbolic description of each tree; and (3) study of the note and map data for estimation of the damage [cf. ibid., viii, p. 209].

The observations on infection and mortality comprise all available facts relating to the condition and pathology of the tree, which are summarized in the form of a definite statement as to the probability of death or survival. The maps are made in the field as the investigation progresses. Each tree is placed as accurately as possible in relation to its neighbours, its size being represented in scale and various symbols used to denote different pathological conditions and other data bearing on the future of the tree. The map, then, shows what trees will remain to make up the stand in relief against those originally available for this purpose; the sizes and crown conditions of the survivors; and the diminution in area of the forest cover because of the disease. In estimating the damage caused by *C. ribicola*, consideration is given to the following factors: (1) reduction of the number of trees by the disease; (2) reduction of area of forest cover; (3) kind of trees left; and (4) spacing of trees.

Figures are given showing the 'imminent mortality' (trees already dead or doomed to die within a measurable period) in eight

experimental plots in several counties of New York, the percentages ranging from 31 to 87, and the losses in board feet of lumber due to blister rust (nil to total). It is evident from these data that no correlation exists between infection percentages, imminent mortality, and percentages of loss in board feet.

FALCK (R.). **Neue Mitteilungen über die Rotfäule.** [New notes on red rot.]—Reprinted from *Mitt. Forstwirtsch. und Forstwissensch.*, *1930*, 42 pp., 4 pl., 12 figs., 1930.

A comprehensive account is given of the writer's investigations at Hann.-Münden, extending over a period of some twenty years, on the red rot of pine trees caused by the independent or combined attacks of *Polyporus* [*Fomes*] *annosus* and *Agaricus melleus* [*Armillaria mellea*: *R.A.M.*, ix, pp. 74, 349]. The former organism is responsible for infection of the base of the trunk as well as the roots and the latter mainly for that of the roots. Both fungi occur in the forest in a saprophytic or semi-parasitic form, generally passing from the dead wood or fallen leaves to the more or less inactive heartwood or the weaker parts of the sapwood. *F. annosus* causes a decay of the 'corrosion' type [ibid., x, p. 148], characterized by the simultaneous disintegration of lignin and cellulose.

Three stages may be distinguished in the red rot of pines due to mixed infection with these two fungi, viz., the so-called 'damp wood stage', in which the main root begins to die off, bacterial contamination follows, and *A. mellea* develops at the collar of the tree; the '*mellea* stage', in which the root collar is hollowed out by the fungus; and the '*annosus* stage', in which *F. annosus* spreads from the cavity of the collar to the trunk. The latter fungus may also cause red rot of the trunks quite independently of *A. mellea*, infection often starting through wounds. Both fungi are commonly found in a saprophytic form on freshly felled wood. *A. mellea* may be classed, on the basis of the author's studies, as a weak semi-parasite and *F. annosus* as a moderately strong one, whereas *Trametes pini* [ibid. ix, p. 74] belongs to a more active group.

The results of a statistical survey [full details of which are given] of the distribution of red rot in the Harz Mountains indicated that the financial loss incurred as a consequence of the disease may amount to 7·2 per cent. of the total value of the wood. Infection was found to be very prevalent on granite, quarzite, and siliceous schist soils, less so on 'greywacke' and slate clay. A correlation was further observed between the incidence of red rot and the steepness and northerly exposure of the stands. The bearing of these observations on the problem of control is discussed.

In connexion with some notes on the life-history of *F. annosus* and *A. mellea*, it is pointed out that the latter is the only forest-inhabiting fungus capable of penetrating, by means of its rhizomorphs, into the deeper soil layers and there attacking the saturated wood accessible solely from the soil. *F. annosus*, on the other hand, is disseminated only by spores, most of which are believed to enter the cavities formed by *A. mellea* with the

currents of cool air engendered by a fall of temperature in the region of the collar as compared with the surrounding atmospheric layer.

Chronique forestière. La maladie du rond. [Forestry notes. The ring disease.]—*Bull. Soc. Centr. Forest. Belgique*, xxxvii, 11, pp. 522–526, 1930.

A full account is given in popular terms of the root rot or 'ring disease' (so called because infection spreads in circular patches of trees) of conifers in France, caused by *Ungulina annosa* [*Fomes annosus*: see preceding abstract]. The most susceptible species is the maritime pine [*Pinus pinaster*], but Scotch pine [*P. sylvestris*], larch, spruce, fir, Weymouth pine [*P. strobus*] and, to a slight extent, beeches are also affected.

When pines are affected, the tree dies while the rot is still wholly confined to the roots, but with spruce, long before the trees die, a red rot of the heartwood of the trunk, accompanied by the exudation of resin, extends for some two metres above the soil level.

Trees of all ages on all types of soil become affected, death ensuing rapidly in young trees, but being delayed for as long as twenty years in older ones. Comparatively rare in natural forests, ring disease is endemic and frequently dangerous in plantations, being particularly destructive to spruce planted in arable or pasture land.

Very serious losses have been sustained in the Sologne district, the Landes, and the central plateau of France.

To arrest the spread of infection through the soil a trench about 80 cm. deep should be dug round the affected patches, the diseased trees being cut down as soon as practicable and the stumps dug out and burnt.

LINDGREN (R. M.). **Preliminary experiments on control of sap-stain and mold in Southern Pine and Sap Gum by chemical treatment.**—*Lumber Trade Journ.*, xcvii, pp. 25–26, figs., 1930.

A series of tests on small-sized wood pieces were carried out for the purpose of determining the relative effectiveness of 23 different chemical treatments in preventing sap stain and mould in green pine [*Pinus palustris*] and sap gum [? *Liquidambar styraciflua*] in the southern United States [cf. *R.A.M.*, ii, p. 185; x, p. 3]. Those proving to be of greatest value against stain fungi in the order of effectiveness were, on pine: 3 per cent. ethyl mercury chloride, soda; and on gum: ethyl mercury chloride and borax.

LINDGREN (R. M.) & SCHEFFER (T. C.). **Prevention of sap-stain and mold in southern woods by chemical treatment.**—*Southern Lumberman*, cxlii, pp. 42–46, figs., 1931.

The current methods of controlling stain and possibilities of improving them are discussed. A summary, including tables, of the results of small-scale tests of 68 different chemical treatments for the prevention of sap stain and mould in green pine and sap gum [see preceding abstract] is presented, together with a similar

summary of the results of subsequent commercial-scale tests. Treatments found most effective were 0·24 per cent. solutions of 3 per cent. ethyl mercury phosphate and 4·3 per cent. ethyl mercury chloride for both pine and gum, and a 5 per cent. solution of commercial borax for gum. In the few tests with it, a 0·24 per cent. solution of sodium orthophenyl phenate was also very effective on pine.

LINDGREN (R. M.). **Prevention of deterioration in stored logs by chemical treatment.**—*Southern Lumberman*, cxli, p. 250, 1930.

A brief discussion of the causes and methods of controlling deterioration in stored logs in the southern United States is presented, together with a description of the chemical control work under way.

LINDGREN (R. M.). **The deterioration of logs in storage and its prevention.**—*Southern Lumberman*, cxxxviii, p. 49, figs., 1930.

The special problems of log storage in the southern United States are mentioned, including a summary of the prevalence of log infection at 57 representative mills. The conditions affecting, and nature of log deterioration are discussed and possible preventive measures suggested.

MOLL (F.). **Ein interessanter Hauschwammfall.** [An interesting case of dry rot.]—*Der Bautenschutz*, i, 10, pp. 134–136, 1930.

Five years ago the porters' dwellings in two neighbouring houses in Berlin became infected by dry rot (*Merulius lacrymans*) [*R.A.M.*, x, p. 77], which was found to have spread to one house from pieces of old wood buried in the garden, and thence through the dividing wall into the next house. The woodwork was effectively disinfected with sodium fluoride (1·5 per cent.) at a cost of about M. 4,000; the sum of M. 8,000 to 10,000 would have been necessary for complete renewal.

BOULTON (H.). **A century of wood preserving.**—x + 150 pp., 2 diags., London, P. Allan & Co., Ltd., 1930.

Two papers by S. B. Boulton, entitled 'The antiseptic treatment of timber' and an addendum 'A few remarks upon timber preservation', dated 1884 and 1909, respectively, are followed by a section 'Later developments in wood preservation' by H. Fergusson (1930). The earlier papers cover the history of timber preservation from early times through the 'railway era', while the last deals with the modern improvements in the various processes of impregnation. Appended are various timber-preserving specifications, a table showing the distinctive properties of coal-tar products and certain other oils, a list of references to authorities mentioned in the preceding papers, and notes on other matters of interest.

The testing of wood preservatives.—*Nature*, cxxvi, 3189, pp. 921–922, 1930.

At a recent conference, held at Berlin-Dahlem, on the testing of wood preservatives, which was attended by representatives of

various European countries, the United States, and Japan, the following subjects were discussed: (1) the most reliable method of investigating wood preservatives; (2) the most suitable fungi for use in experiments with these preparations; and (3) the degree to which conclusions as to the practical value of a wood preservative may be drawn from a determination of its toxicity under laboratory conditions.

It was decided that the wood block method (using Kolle flasks) should be considered suitable for the estimation of the efficiency of a preservative against fungi. The agar method should only be regarded as useful for the preliminary investigation of the toxicity to fungi of any new material [*R.A.M.*, ix, p. 754]. The inhibition point in the wood block method is to be expressed as kilograms of preservative per cubic metre of wood. In the agar method the inhibition point is to be expressed as the interval between that concentration of the material under test, in the artificial medium, at which growth just take place, and the next concentration above it in the series which prevents all growth.

More than one fungus should be used in the tests on impregnated wood, but *Coniophora cerebella* should be included. No decision was reached as to a second organism to be used for this purpose. General objection was raised to the employment of *Fomes annosus* [ibid., x, p. 217], partly because it cannot be regarded as a typical destroyer of dead, constructional timber, and partly on account of its insufficient resistance to a number of antiseptics.

The members of the conference were unanimous that the determination of the toxicity to fungi of any material is inadequate for the determination of its value as a wood preservative; its susceptibility to leaching, and physical and chemical stability in the wood are also essential factors.

FALCK (R.). **Nachweise der Humusbildung und Humuszehrung durch bestimmte Arten höherer Fadenpilze im Waldboden.** [Demonstrations of humus formation and humus disintegration by certain species of higher Hyphomycetes in forest soil.]—Reprinted from *Forstarch., 1930*, 12 pp., 2 figs., 1930.

This is an expanded account of the author's investigations on the part played by certain fungi in the formation and disintegration of humus in German forest soils, a condensed version of which has already appeared [*R.A.M.*, x, p. 148].

ZAUMEYER (W. J.). **Bean diseases in western United States in 1930.**—*Plant Disease Reporter*, xiv, 22, pp. 228–239, 1930.

During 1930 the bacterial blight of beans [*Phaseolus vulgaris*] which may be caused either by *Bacterium phaseoli* or *Bact. medicaginis* var. *phaseolicola* [*R.A.M.*, x, p. 6] occurred sparingly in Utah, Colorado, and Wyoming, and somewhat more abundantly in Montana; in Idaho there was only a trace of infection while none was recorded in California. The bacterial blight of Lima beans [*P. lunatus*] due to *Bact. vignae* occurred to a slight extent in Colorado, where the disease was confined to fields planted with local seed, being absent from those in which Californian seed was used. Anthracnose (*Colletotrichum lindemuthianum*) was not

observed in any of the commercial fields inspected, but a trace of infection occurred in trial plots at Greeley, Colorado, planted with eastern-grown seed. As in 1929, mosaic [ibid., x, p. 283] was widespread, especially in southern Idaho, where curly top also occurred in a destructive form, the incidence of this disease being correlated with the dispersal of the beet leafhopper (*Eutettix tenella*) [ibid., ix, p. 228]. *Pythium* wilt caused by *P. butleri* was observed in the Greeley district of Colorado, being most severe on the Late Stringless Green Refugee variety. It followed a short period of flooding from irrigation water during a hot spell. Up to 10 or 12 per cent. of the plants were attacked in the flooded area and a few elsewhere. Root rots (*Fusarium* and *Rhizoctonia* spp.) were observed in small amounts in all the States inspected, but caused little damage. Powdery mildew (*Erysiphe polygoni*) [ibid., viii, p. 21] was observed only in California, where the injury from this source was slight. Rust (*Uromyces appendiculatus*) [ibid., vii, p. 531] was of minor importance in Colorado and southern California, and *Sclerotinia libertiana* [*S. sclerotiorum*] did a good deal of damage to a field of Full Measure beans in Montana.

NICOLAS (G.) & AGGÉRY (Mlle). **Une maladie grave de l'Aubergine en 1930.** [A serious disease of Eggplant in 1930.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 10, pp. 394–395, 1930.

In August, 1930, eggplants growing in the vicinity of Toulouse were severely attacked by *Sclerotinia libertiana* [*S. sclerotiorum*], the yield being appreciably reduced. In October, the withered stems showed the presence, on the surface or in the pith, of numerous sclerotia measuring several millimetres in diameter. Unless a suitable method of soil disinfection can be devised, the growers may shortly have to abandon this crop.

MOREAU (L.) & VINET (E.). **De la valeur des 'traitements d'assurance' dans la lutte contre les ennemis de la Grappe.** [On the value of 'guarantee treatments' in the campaign against the enemies of the Grape.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 33, pp. 1106–1111, 1930.

In this paper (preceded on pp. 103–106 by an explanatory note by P. Gervais) the writers describe the highly satisfactory results obtained in their experiments against vine mildew [*Plasmopara viticola*] in Anjou, by applying a strongly alkaline Bordeaux mixture (2 per cent.) twice between 22nd May and 5th June. A weaker concentration (0·6 per cent.) was also moderately efficacious. These so-called 'guarantee treatments' (which may be supplemented by a third application between 10th and 15th June) are stated to ensure a good harvest even in seasons marked by a severe epidemic of the fungus.

WORMALD (H.). **Ripe rot of Grapes.**—*Gard. Chron.*, lxxxviii, 2294, pp. 498–500, 5 figs., 1930.

Two cases are reported of ripe rot of white Muscat grapes (*Glomerella cingulata*), near Hawkhurst, Kent, and at Tring, Herts in September and October, 1930. The diseased berries were

purplish, flaccid, and shrunken, somewhat resembling raisins. The fungus [the life-history of which is described in popular terms] was isolated from the infected fruit and inoculated into Cox's Orange Pippin, Allington Pippin, Lane's Prince Albert, and Newton Wonder apples, on which the typical symptoms of bitter rot developed [*R.A.M.*, iv, p. 174]. There appears to have been no recent record of *G. cingulata* on grapes in England, but in America the disease is responsible for heavy losses on outdoor fruit during wet seasons [ibid., iv, p. 141]. Brief directions are given for the control of ripe rot under greenhouse conditions.

RAVAZ (L.). **Chronique. Nouvelle extension de l'excoriose.** [Current events. A new extension of excoriosis.]—*Prog. Agric. et Vitic.*, xciv, 51, pp. 587–588, 1930.

A grower from Hérault reports that the excoriosis disease [*Phoma flaccida*: *R.A.M.*, viii, p. 484] is very severe in his vineyard, where it has been present for ten years, Aramon vines being much more severely attacked than the neighbouring Chasselas, Carignan, Bourret, Petit-Bouschet, and Aspiran varieties [cf. ibid., viii, p. 223]. Other growers in the vicinity as a result of inadequate spraying have lost three-quarters of their grapes.

The control methods recommended consist in retaining only healthy shoots, or if others must be used, cutting them down to four eyes. After pruning, the vines and especially the cut-back shoots should be treated with 35 per cent. iron sulphate solution or 10 per cent. (by weight) sulphuric acid; shortly before the new shoots appear the vines should be sprayed with 4 per cent. Bordeaux mixture, this application being repeated when the shoots reach a length of 4 or 5 cm.

WAHL (B.). **Bericht über die Tätigkeit der Bundesanstalt für Pflanzenschutz in Wien im Jahre 1926.** [Report on the work of the Federal Institute for Plant Protection in Vienna in the year 1926.]—*Verlag der Bundesanst. für Pflanzenschutz*, Wien II, 79 pp., 1931.

Notes are given on the phytopathological investigations and experiments conducted by the members of the Federal Institute for Plant Protection in Vienna during 1926 [*R.A.M.*, vi, p. 530], together with a list of papers issued from the Institute during the years 1902 to 1926 and a subject-index of the reports for the same period.

CONNERS (I. L.). **Ninth annual report on the prevalence of plant diseases in the Dominion of Canada 1929.**—*Canada Dept. of Agric., Exper. Farms Branch*, 82 pp., 1931. [Mimeographed.]

Notes are given on the occurrence of fungous, bacterial, and non-parasitic diseases on cereals, fodder crops, potatoes and other vegetables, fruit, forest and shade trees, tobacco, and miscellaneous plants in Canada during 1929.

CONNERS (I. L.) & EARDLEY (E. A.). **Tenth annual report on the prevalence of plant diseases in the Dominion of Canada 1930.**—*Canada Dept. of Agric., Exper. Farms Branch*, 102 pp., 3 maps, 1931. [Mimeographed.]

This report on the prevalence of plant diseases in Canada during 1930 is prepared on similar lines to that of the previous year [see preceding abstract].

SUNDARARAMAN (S.). **Administration Report of the Mycologist for the year 1929-30.**—30 pp., 2 graphs. [Received March, 1931.]

Complete immunity from mosaic was exhibited by the Co. 205, Co. 214, Co. 244, and Kassoer sugar-cane varieties in an experimental plot at Coimbatore, Madras, on which observations were made during the period from April to September, 1929 [*R.A.M.*, ix, p. 87]. The first-named variety, however, is reported to be highly susceptible to the disease at Pusa. A marked degree of resistance was shown by the P.O.J. 2714 and 2727 varieties.

During the year streak disease of sugar-cane (Co. 213) appeared for the first time in Madras [ibid., vii, p. 397].

The boll rot and seedling blight of cotton (*Gossypium herbaceum*) caused by *Colletotrichum* (*Vermicularia*) [ibid., ix, p. 87] was found to cause an average loss of weight in seed cotton of 48·4 per cent., and a reduction in the ginning percentage of 9·8 per cent. The percentages of infected seedlings developing from two lots of diseased bolls were 29 and 34, respectively, while those from healthy bolls were quite free from blight. The causal organism of this disease has been found to occur on the common weed *Aristolochia bracteata*, cross-inoculation tests with which and *G. herbaceum* gave positive results.

Cross-inoculation experiments [the results of which are tabulated] showed that three distinct strains of *Macrophomina phaseoli* occur on groundnuts [loc. cit.], black gram [*Phaseolus mungo*], and gingelly [*Sesamum indicum*], that of *P. mungo* being the most virulent and that of groundnut the least so. The sclerotia of the fungus were found to remain viable at room temperature for a period of 54 months. It was shown by pot culture experiments with *S. indicum* that wilting is much more prevalent (45 compared with 9 per cent.) in infected soil without a layer of sand at the bottom of the pot than in similar soil with one. Flax, green gram (*P. mungo* var. *radiatus*), and niger seed (*Guizotia abyssinica*) have also been found susceptible to *M. phaseoli* at Coimbatore. Among the 28 varieties [which are listed] of groundnut tested for their reaction to *M. phaseoli*, Sogathur and local Mauritius were the most resistant and Gudyatham bunch, Valencia, and other Spanish varieties the most susceptible.

The fungus responsible for the 'sugary disease' of sorghum (*Sphacelia sorghi*) [*R.A.M.*, viii, p. 355] was found to be capable of infecting the heads both in the milk and flower stages, but not after the grains are set.

A new fungous disease causing foot rot and wilt of rice has been reported from the Maruteru Agricultural Research Station. The infected tillers are abnormally elongated and come into 'shot

blade' several weeks before healthy plants; they bear pale green flags and rise conspicuously above the general level of the crop, giving the latter the appearance of being sown with an admixture of short duration seed [ibid., x, p. 336]. Plants reaching this stage die out in the course of a week.

The number of Palmyra palms [*Borassus flabellifer*] eradicated on account of bud rot [*Phytophthora palmivora*] during the period under review was 4,200, compared with 6,482 in 1928 [ibid., viii, p. 89]. The incidence of this disease is steadily declining, the results being particularly noticeable in the heavily infected districts of East Godavari.

MARTYN (E. B.). **Botanical and Mycological Division. Annual Report, 1929.**—*Agric. Journ. Brit. Guiana*, iii, 4, pp. 226–233, 1930.

Sugar-cane mosaic, which is not known to occur in British Guiana, was found during 1929 in several fields, mostly of D. 625 canes, in Surinam. As no attempt had been made at control, up to 100 per cent. infection was present on the third and fourth ratoons.

Isolated cases of sugar-cane root disease are present at all seasons on most estates in British Guiana, affected stools growing directly next to apparently healthy ones [*R.A.M.*, vi, p. 211]. That in certain instances the disease is due to soil conditions was indicated by its disappearance from beds treated with filter press mud or pen manure. A chlorotic appearance of young cane leaves was occasionally noted. During the dry season a field of six weeks' old ratoons showed leaves with almost complete chlorosis or bearing long, white, chlorotic strips: three months later, the condition had almost entirely disappeared. A second type of chlorosis affected half-a-dozen varieties, on some canes causing the whole leaf except the midrib to appear chlorotic, while on others the condition was confined to patches or narrow strips or was merely a chlorotic flecking. A month later chlorotic plants had become very uncommon. Both forms of chlorosis were apparently due to some temporary environmental factor.

The disease known locally as 'man rice' periodically affects a few plants in the rice beds, the symptoms first becoming apparent two or three weeks after transplanting, when isolated plants are noted as being taller than the rest, as well as spindly and chlorotic [see preceding abstract]. One or two such plants are usually present in a clump in which the remainder are healthy. The Demerara Creole variety appears to be more susceptible than others at the Experimental Station. Affected plants show a poor development of the finer feeding roots and root hairs; many die and in others either no flowering heads are formed or those that are produced do not open. The condition differs from the American 'straighthead' [ibid., i, p. 83] in that the rice becomes chlorotic. From the base of affected stems several species of bacteria, a *Fusarium* resembling *F. moniliforme* [*Gibberella moniliformis*], and a strain of *Corticium solani* were isolated.

The non-parasitic wilt of coco-nut, which appears to be entirely comparable with that present in Trinidad [ibid., ix, p. 714], was

present wherever the trees were planted in the stiff clay soil of the coastal belt; it is attributed chiefly to unsuitable environment and cultural conditions. That the trees usually wilt in groups suggests that fungi or bacteria may play a secondary part in its extension.

Wilted plantains [*Musa paradisiaca*] and Cayenne bananas showed the presence of several strains of *Fusarium cubense* [ibid., ix, p. 796] as well as of bacteria.

A die-back of balata trees (*Mimusops* sp.) was present in the North-West District; in the early stages the twigs died back and the leaves withered. At first these dying stems showed brown patches at intervals under the bark, and later became entirely brown and dry. An early symptom was the cessation of the flow of latex. The affected trees were growing on a steep hillside, the soil of which had been much leached and eroded by rain.

Borg (P.). **Appendix F. Report of the Plant Pathologist.**—*Ann. Rept. on the Working of the Malta Dept. of Agric. during 1929–30*, pp. xiv–xvii, 1930.

In many parts of Malta and Gozo, the cumin-seed plant [*Cuminum cyminum*] was severely attacked by a powdery mildew, probably *Erysiphe 'communis'* [*R.A.M.*, iv, p. 391]. The plants became covered with a white powder and afterwards turned black and died. Good control was effected by timely dusting with sulphur.

Diseases of plants.—*Fifth Bienn. Rept. Kansas Agric. Exper. Stat. for the biennium July 1, 1928, to June 30, 1930*, pp. 97–103, 1930. [Received April, 1931.]

Preliminary experiments in the control of barley stripe [*Helminthosporium gramineum*] with ceresan gave satisfactory results, the incidence of infection being reduced from over 10 per cent. to a trace [*R.A.M.*, ix, p. 711].

At least two physiologic forms of loose smut of oats [*Ustilago avenae*] have been found to occur in Kansas [ibid., ix, p. 372], to one of which the supposedly resistant Kanota and Fulghum varieties proved susceptible. Almost complete control of the disease was given by ceresan, 'oat dust', and smuttox [ibid., ix, 299].

Kernel smut of sorghum (*Sphacelotheca sorghi*) was well controlled by copper carbonate and sulphur dusts [ibid., viii, p. 427]. Leaf stripe (*Bacterium andropogoni*) [ibid., ix, p. 774] occurred in a severe form on sorghum in nursery rows and field plots at Manhattan in 1927 and 1928, marked differences in varietal susceptibility being observed.

Millet [*Setaria italica*] smut [*U. crameri*] proved amenable to control by copper carbonate but not by sulphur dusts [ibid., viii, p. 427].

Inbred lines of maize have become fixed in their reaction to natural infection by smut [*U. zeae*: ibid., x, pp. 95, 180], some being immune, others extremely susceptible, and a large number intermediate. The reaction to smut of some F_1 crosses of these lines in 1929 was studied. In one cross of a high × low smut line, the F_1 hybrids remained immune and in the reciprocal cross only

one plant out of 50 was smutted. The F_1 hybrids of high × intermediate smut lines were less resistant than open-pollinated plants of the same variety. Those derived from high × high smut lines were very susceptible.

No consistent or outstanding differences in stand or yield have been obtained by treating good quality seed maize with organic mercury compounds or other disinfectants against seed-borne diseases as compared with untreated seed.

No detrimental effects on cattle and horses followed the consumption of smutted maize or sorghum. The viability of the spores of the fungi [*U. zeae* and *S. sorghi*] was found to be almost completely destroyed by passage through the digestive tract of these animals, so no importance need be attached to this factor in the perpetuation of infection.

A study of bunt [*Tilletia foetens*] collections used on 16 wheat varieties indicates the occurrence of several distinct physiologic forms in Kansas. Turkey, Ridit, and Banner Berkeley showed the greatest difference in reaction to these collections. In a uniform winter wheat bunt nursery, where collections were used from Kansas, Nebraska, South Dakota, Minnesota, Colorado, and Montana, Minturki C.I. 6155, Minturki × Bel-Buffum C.I. 8033, and Oro C.I. 8220 were the most resistant varieties. All the others were susceptible to every collection of bunt, except Newturk, Kanred, Tenmarq, and Nebraska No. 60, which were resistant to the strains from Redfield, South Dakota.

Fairly good control of foot rot of wheat (*Ophiobolus graminis*) [ibid., ix, p. 167] was obtained by the use of organic fertilizers, especially chicken manure, and by sweet clover [*Melilotus alba*] and lucerne ploughed under for green manure. No variety has shown outstanding resistance to *O. graminis* in these experiments, while many were so susceptible that they had to be discarded.

Detailed studies have been made on the inheritance of resistance to leaf rust of wheat [*Puccinia triticina*: see below, p. 367] in over 70 crosses. Resistance was shown by greenhouse tests to be usually recessive and dependent on a single main factor difference for its expression [ibid., vii, p. 766]. Two or more factors, however, are sometimes involved and an inhibitor for susceptibility is operative. Physiologic form 9 is the most widely distributed in the Southern Great Plains.

The best control of potato scab [*Actinomyces scabies*] was obtained by the application of 600 lb. sulphur per acre to plots on which cowpeas or vetch had previously been grown as green manures [ibid., viii, p. 458]. Sulphur applications alone decrease the yield as well as reducing the incidence of scab, but the combination with leguminous fertilizing crops prevents any lowering of production.

In 1928 the sweet potato sprouts dipped in Bordeaux mixture for the control of stem rot [*Fusarium batatatis* and *F. oxysporum*; ibid., x, p. 269] yielded 16·6 per cent. more than the untreated, the corresponding figure in 1929 being 12 per cent., with a reduction of infection of 22·5 per cent. Mercury hydroxide reduced infection by 18·5 per cent. and increased the yield by 11·5 per cent., the corresponding figures for semesan bel being 23 and 11 per cent.

The application of sulphur dust to Jonathan apples reduced the incidence of cedar rust [*Gymnosporangium juniperi-virginianae*: ibid., viii, p. 428], but no advantage was derived from the use of oxidizing as compared with non-oxidizing dusts.

Bureau of Agricultural Industry.—*Fourth Bienn. Rept. Michigan Dept. of Agric. for the fiscal years ending June 30, 1929 and 1930*, pp. 19–57, 14 figs., 1 map, 1931.

The following items of phytopathological interest occur in this report. 'Red suture', a virus disease of peaches known only in Allegan County previous to 1929, was detected in Berrien and Oceana Counties during the period under review. In several cases entire peach orchards were condemned under the regulations of the peach inspection service, on account of heavy virus disease infections. Approximately 5 per cent. of yellows [*R.A.M.*, ix, p. 667] was reported to occur among 12,575 peach trees planted in Van Buren County in 1929.

During 1928 the causal organism of white pine blister rust [*Cronartium ribicola*] was detected in 13 additional counties [ibid., ix, p. 8], making a total of 31 infected counties in the State. Practically 90 per cent. of the infections found were on cultivated black currants. Native white pines [*Pinus strobus*] at Indian River, Cheboygan County, were found for the first time to be attacked by the blister rust. Some 1,500 acres were immediately cleared of currants and gooseberries at public expense. Later, infection on native pines was observed in Marquette, Dickinson, and Menominee County. Eighty-four per cent. of the trees (mostly under 20 years) on a study plot in Dickinson County were found to be infected and a few were already killed. In a similar plot in Marquette County 74 per cent. infection was recorded.

Since the inception of the barberry eradication campaign in 1918 [ibid., x, p. 171], 781,262 bushes and 4,907,717 seedlings have been uprooted in the State. The loss due to black stem rust of small grains [*Puccinia graminis*] during the last season was less than 0·5 per cent.

Brentzel (W. E.). **Plant pathology.** [*ex* Experiment Station Progress: Report for Biennium July 1, 1927 to June 30, 1929.]—*North Dakota Agric. Exper. Stat. Bull.* 233, pp. 97–105, 9 figs., 1930. [Received April, 1931.]

Among the various compounds tested for the control of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] the most satisfactory were copper carbonate (20 per cent. metallic copper) and formaldehyde [*R.A.M.*, x, p. 229]. A number of other preparations, e.g., uspulun, semesan, germisan, abavit B, and chlorophol completely prevented the development of infection, but for various reasons these are less suitable for farm use.

Good control of barley stripe [*Helminthosporium gramineum*] has been given by dusting with ceresan (3 oz. per bushel), höchst, abavit B, or germisan, as well as by the less convenient method of two hours' immersion in formaldehyde.

Considerable difficulty has been experienced in the control of the 'pasmo' disease of flax [*Phlyctaena linicola*: ibid., x, p. 315],

to which all the Argentine varieties and hybrids tested proved susceptible. An important source of infection is the diseased straw, stubble, or leaves left in the field after harvest.

It is not always possible to detect slight spindle tuber infection in seed potatoes, yet very pronounced symptoms of the disease may develop in the resulting plants.

HANNA (W. F.). **Nuclear association in the aecium of Puccinia graminis.**—Abs. in *Phytopath.*, xxi, 1, p. 107, 1931.

Investigations [at the Dominion Rust Research Laboratory, Winnipeg] showed that the sporidia of *Puccinia graminis* are uninucleate [*R.A.M.*, x, p. 168]. Secondary sporidia have been produced under certain conditions. Monosporidial infections on the barberry give rise, on the upper leaf surface, to pycnidia containing many uninucleate pycnospores and, near the lower surface, to crescent-shaped wefts of uninucleate hyphae. The stimulus of gravity does not appear to determine the part of the leaf in which these organs develop. About 48 hours after pycnospore-containing nectar from a pycnidium of one sex is applied to a pycnidium of opposite sex, binucleate cells appear in the hyphal wefts near the lower leaf surface. Shortly afterwards, multinucleate cells are found near the centre of the weft, as many as 16 nuclei having been counted in a single cell. Some of these binucleate and multinucleate cells arise by cell fusions. The paired nuclei of the aecidiospores are considered to be descendants of nuclei associated in this manner. In one preparation a nucleus was found apparently migrating through the cell wall into an adjacent cell. A few germinating pycnospores have been found, but their part in the initiation of aecidial development is not fully understood.

NEWTON (MARGARET), JOHNSON (T.), & BROWN (A. M.). **Hybridization between Puccinia graminis tritici and Puccinia graminis secalis.**—Abs. in *Phytopath.*, xxi, 1, pp. 106–107, 1931.

Crosses between forms 30 and 95 of *Puccinia graminis tritici* and a field culture of *P. g. secalis* have resulted in the production of four hybrid rust forms, three of which have not hitherto been described [*R.A.M.*, x, p. 169 and next abstract]. These hybrids resemble each other somewhat closely in pathogenic characters. They are much less virulent on wheat varieties than other known physiologic forms of the *tritici* series, and likewise less virulent on rye than other forms of the *secalis* series.

LEVINE (M. N.) & COTTER (R. U.). **A synthetic production of Puccinia graminis hordei F. and J.**—Abs. in *Phytopath.*, xxi, 1, p. 107, 1931.

By crossing pycnidia of *P. graminis secalis* and *P. g. tritici* on barberry, the writers recently obtained a strain of black rust capable of producing fairly severe infection on certain varieties of rye and wheat, which neither parent alone could do [*R.A.M.*, x, p. 15 and preceding abstract]. Barley is also quite susceptible to

this hybrid, and it is thought that the actual production of *P. graminis hordei* may here be involved.

MELANDER (L. W.). **The effect of temperature and light on the development of the uredinial stage of Puccinia graminis.**—Abs. in *Phytopath.*, xxi, 1, p. 109, 1931.

In experiments at the Minnesota Agricultural Experiment Station uredospores of *Puccinia graminis*, hardened for ten days by exposure to temperatures of 0° to 10°C., withstood low temperatures on dry glass slides in a freezing chamber better than non-hardened ones. Hardened uredospores survived 40 to 45 days at −29° to −40°. After six days of alternating high and low temperatures the percentage of viable spores was reduced. At 10° uredosori appeared a week later than at 20°. They developed slowly at 0° to 1°, and in some cases the type of infection differed from the normal type produced at 10° to 20°. *P. g. tritici* form 36 produced numerous uredosori after 59 days at 0° to 1°; form 35 produced minute uredosori on Little Club wheat; form 15 usually failed to produce uredosori within 80 days. When re-exposed to 20°, type 1 uredosori [*R.A.M.*, ii, p. 158] became type 3, and form 15, dormant at 0° to 1° in wheat plants, produced normal uredosori. The formation of teleutospores on wheat, oats, and rye was stimulated at 0° to 1°. Both rust and host withstood −10° for 24 hours.

Low light intensities retarded stem rust development. Uredospores of *P. g. tritici* form 15 produced in a light intensity of 302 foot-candles at 20° were longer and better able to resist temperatures of −29° to −40° for 24 hours than those formed at higher or lower light intensities.

JOHNSON (T.). **Germination of Wheat stem rust teliospores formed in the greenhouse.**—Abs. in *Phytopath.*, xxi, 1, p. 108, 1931.

Attempts were made [at the Dominion Rust Research Laboratory, Winnipeg] to curtail the dormancy period of wheat stem rust [*Puccinia graminis*] teleutospores formed in the greenhouse by freezing and by alternate wetting and drying [*R.A.M.*, viii, p. 364]. In most cases either of these treatments shortened the period of dormancy, and a combination of the two, i.e., two to seven days' freezing followed by alternate wetting and drying, invariably resulted in germination. Teleutospores formed at temperatures of 55° to 60° F. germinated more profusely when subjected to this treatment than those produced at higher ones (70° to 75°). Teleutospores formed in nature on *Agropyron repens* and *Hordeum jubatum* in September, 1929, also responded to freezing followed by alternate wetting and drying and germinated abundantly at the beginning of December. Teleutospores collected on *H. jubatum* and wheat out-of-doors on 3rd September, 1930, began to germinate on 19th September after the same treatment. The shortest period elapsing in the greenhouse between the completion of teleutospore formation and germination was 20 days, and the shortest period from the inoculation of wheat plants with uredospores to the germination of the teleutospores formed on them was 55 days.

WATERHOUSE (W. L.). **Australian rust studies. III. Initial results of breeding for rust resistance.**—*Proc. Linn. Soc. New South Wales*, lv, 5, pp. 596–636, 3 pl., 1930.

In this paper [in continuation of his studies on Australian cereal rusts; *R.A.M.*, ix, p. 703] the author describes and discusses in detail the preliminary results of several years' work at the University of Sydney in the breeding of varieties of wheat and oats for resistance to rusts. A brief description is given of a method of crossing which, under the conditions obtaining at the University, gave 75 per cent. success in wheats. All attempts to cross wheat and barley met with complete failure, and the only cross obtained between wheat and rye proved to be sterile. Numerous attempts to cross the rust-resistant Khapli emmer with *vulgare* wheats gave little promise of success, and an indirect method is now being investigated for imparting to *vulgare* wheats the resistance of Khapli. A preliminary investigation of crosses between *durum* and *vulgare* wheats indicated the presence in the former of a single dominant factor for resistance to *Puccinia graminis tritici* form 43.

The study of the F_1, F_2, and F_3 progenies of crosses between the two *vulgare* varieties Canberra (resistant to forms 43, 44, and 54, and susceptible to forms 45, 46, and 55 of *P. g. tritici*) and Thew (showing reciprocal reactions to these forms) indicated the existence in each parent of a single dominant factor for resistance. Since the progeny of these crosses later proved to be susceptible to form 34 which superseded the other six forms in Australia after 1926 [ibid., ix, p. 438], they are being crossed with two varieties from Minnesota, both of which show resistance to form 34. The crosses between Canberra and Thew also gave indications of inheritance of resistance to the Australian form 1 of *P. triticina*, due to a single dominant factor for resistance which is inherited independently of the factor for resistance to form 43 of *P. g. tritici*. In the Thew variety there was evidence of the existence of an additional independent factor for resistance to the Australian form 1 of *P. triticina*, linked with a factor for resistance to one form of *Erysiphe graminis*. A single dominant factor for resistance to *P. triticina* was also found in the Japanese Bearded variety.

The general results of studies of other wheats showed that, in all the cases examined, the inheritance of resistance to forms 43 and 45 of *P. g. tritici* is due to a single dominant factor for resistance, while the inheritance of resistance to form 34 is due to one factor (or more) with clear dominance of susceptibility.

DRAGHETTI (A.). **Osservazioni e ricerche sulla resistenza alla ruggine dell' internodo superiore nel Frumento. Ricerche genetiche e morfologiche.** [Observations and researches on the resistance to rust of the upper internode of Wheat. Genetic and morphological investigations.]—*Ann. R. Staz. Sper. Agraria di Modena*, N.S., i, pp. 69–121, 3 pl., 1930.

In a preliminary discussion of the complexity of the many factors involved in the resistance shown by different varieties and races

of wheat to rusts (*Puccinia* spp.), the author points out that as attention has in the past mainly been directed to the presence of the disease only on the leaves, the view has come to be accepted that rust resistance in wheat is a congenital, definitely humoral or plasmatic character, equally affecting all the organs. The fact is, however, that resistance is profoundly modified by physiological growth characters [*R.A.M.*, vii, p. 769], the leaves, sheaths, and green parts of the internodes showing, respectively, different degrees of resistance owing to the co-existence of congenital resistance and resistance derived from physiological and vegetative factors. There is, further, a marked difference in the degrees of resistance shown even by the lower, middle, and top parts or thirds of one and the same organ.

In the studies described in this paper the degree of rust infection on the main stem of mature, harvested wheat was estimated according to a modified form of Stakman's scale [ibid., ii, p. 158], the observations being confined to the upper leaf sheath and the free part of the last internode. The degree of infection on the internode as a whole was calculated as the average of the other two results. In each of these parts the lower, middle, and upper sections or thirds were treated as distinct.

The material studied consisted of 40 F_2 segregated progenies from crosses made in 1925 between four races resistant and four susceptible to *P. graminis*, on the one hand, and two hybrids susceptible to *P. triticina* and moderately resistant to *P. glumarum* and *P. graminis* on the other. During the period of natural infection the plants of the F_1 generation of 1926 and those of the segregated F_2 generation of 1927 were repeatedly infected by being beaten with bundles of diseased wheat stalks.

The observations made on the upper sheath and free part of the subtending internode gave about the usual Mendelian ratios, but this was seldom the case when the value of the degree of infection was based on the plant as a whole, probably owing to physiologic factors.

The results obtained as to the relative susceptibility of the various parts are fully discussed and tables are given showing the degree of infection in the sheath and free internode in the F_1 generation, the percentages of resistant, moderately susceptible, and susceptible plants in the F_2 generation, the inheritance of resistance in the three parts of each organ in 19 F_2 progenies comprising over 2,000 plants, and the proportion of cases of immunity and severest infection in the same parts of 1,600 plants.

That the upper internode and the upper sheath are physiologically closely related was indicated by the fact that the percentages of plants in the F_2 generation in which the former was, respectively, resistant, moderately susceptible, and susceptible were 31·6, 49·5, and 18·8, while the corresponding figures for the sheath were 29·9, 44·9 and 24·5. The average degrees of infection for the lower, middle, and upper parts of the sheath were, respectively, 1·3, 1·1, and 0·7, the corresponding figures for the free internode being 1·5, 1·3, and 0·4. It was further ascertained that on an average 28·3, 40·6, and 53·2 per cent. of the lower, middle, and upper parts, respectively, of the sheath remained free from attack, the figures

for the same parts of the internode being 27·5, 30·3, and 67·3 per cent. The figures obtained for maximum infection for the same parts of the sheath and internode, respectively, were 176, 115, and 38 and 149, 87, and 10, out of 1,600 plants.

These results clearly demonstrate that the free internode is appreciably more resistant to rusts than is the leaf sheath, and that in both organs resistance progressively increases from the base up.

A detailed account is given of a study of the relationship existing between rust resistance and the morphology of the organs, the points dealt with including the presence and absence of awns, the height of the plant, the number of culms, the length and compactness of the ear, the length of the last internode and sheath, the duration of the vegetative cycle, and the mechanism of the inheritance of resistance in the field. It was found that the influence of varietal morphological characters becomes evident only in certain environmental conditions, when ecological factors do not prevail over physiological race characters. Probably morphological characters always tend to increase or reduce the inherent resistance of the genotypes, but the result of the influence is not always apparent owing to physiological disturbances due to external factors.

The four biologic types or groups into which the author earlier divided wheat varieties [ibid., vii, p. 769] with regard to rust resistance, viz., (1) awned with compact ear, (2) awned with loose ear, (3) awnless with loose ear, and (4) awnless with compact ear are valid only for analogous conditions in the length of the vegetative cycle and in specific resistance. To ascertain the true behaviour of these biologic types all the factors dealt with in this paper must be considered. This gives a biologic classification of the forms of rust resistance by which all varieties and races of wheat in any locality fall into two main groups, specifically resistant and specifically susceptible, according to the presence or absence of the congenital plasmatic factor. Each group may further be subdivided, according to the length of the vegetative cycle, into 'precocious', 'moderately precocious', and late wheats. This gives six sub-groups of fundamental biological importance, viz., (1) wheats with specific and phenological resistance, (2) wheats with specific resistance and moderate phenological resistance, (3) wheats with specific but without phenological resistance, (4) wheats with phenological resistance only, (5) wheats with a weak phenological resistance only, and (6) wheats with neither specific nor phenological resistance. Groups 1 to 3 and also 4 to 6 represent two series of gradually decreasing resistance.

Groups 1 to 3 show a degree of field resistance related to the probability of their escaping infection phenologically, i.e., a resistance correlated with the length of the vegetative cycle. In these groups infection, taken as a whole, is not usually severe, except in group 3, which consists of late wheats.

In groups 4 to 6 the severity and prevalence of infection may vary widely, according to the external conditions of growth, and may be serious on all the varieties, especially in group 6, so much so as to make cultivation impossible owing to the risk involved;

wheats in group 4, however, may be widely grown if the ecological conditions are favourable.

Each of the groups reacts differently to infection according to the type of climate in which it is grown; the awned and awnless types with loose ear are completely immune in hot or cold dry climates, frequently susceptible in cold, wet climates, and markedly susceptible in warm, wet climates; whereas the awned or awnless types with compact ear, while also completely immune in hot or cold dry climates, are markedly susceptible in cold, wet climates and completely susceptible under warm, wet conditions.

[A shorter version of this paper appears in *Riv. Pat. Veg.*, xx, 5–6, pp. 121–131, 2 figs., 1930.]

JOHNSTON (C. O.). **Effect of leaf rust infection on yield of certain varieties of Wheat.**—*Journ. Amer. Soc. Agron.*, xxiii, 1, pp. 1–12, 1931.

The results [which are discussed and tabulated] of three years' greenhouse and two years' field experiments at Manhattan, Kansas, showed that heavy infection of wheat by leaf rust (*Puccinia triticina*) greatly reduced the yield [*R.A.M.*, ix, p. 583]. In the greenhouse the yield of the susceptible Malakof C.I. 4898 was reduced by 55·71 per cent., while a decrease of 22·30 per cent. was caused in the resistant Fulhard C.I. 8257. Field experiments with Prelude spring and Turkey winter wheat substantiated the results of the greenhouse tests. Partial control of rust in field plots by sulphur dusting (Niagara sulfodust) at two-day intervals during the late spring resulted in an increase of 1·7 and 2·3 bushels per acre for Prelude and Turkey, respectively. The field data further indicated that part of the reduction in yield from leaf rust is due to the smaller size of the individual grains of infected plants.

DOAK (K. D.). **Effect of mineral nutrition on the reaction of Wheat varieties to leaf rust.**—Abs. in *Phytopath.*, xxi, 1, pp. 108–109, 1931.

Wheat varieties reacting divergently to one physiologic form of leaf rust (*Puccinia triticina*) were grown in sand cultures providing different degrees of excess and deficiency in nitrogen, phosphorus, and potassium [cf. *R.A.M.*, ix, p. 443]. Nitrogen was found to increase susceptibility to the disease, while phosphorus and potassium reduced it. Excess nitrogen induced the development of larger primary uredosori and more numerous secondary ones and decreased chlorosis. Phosphorus in excess increased chlorosis, did not reduce the size of primary uredosori, and delayed or prevented the development of secondary ones. Excess potassium increased chlorosis and also reduced the size of the primary uredosori; secondary uredosori appeared in incomplete rings round the primary ones. In varieties of intermediate reaction, excess nitrogen increased the percentage of infected points with uredosori, while nitrogen deficiency, excess phosphorus, and excess potassium decreased it. Phosphorus deficiency reduced chlorosis in both susceptible and intermediate varieties, but the uredosori were always small. Potassium deficiency decreased chlorosis but failed to reduce

the size of the uredosori. A few resistant varieties reacted similarly to the intermediates.

VERWOERD (L.). **The biology, parasitism and control of Urocystis tritici, Koern., the causal organism of flag smut in Wheat (Triticum spp.) and recording the occurrence of Urocystis occulta (Wallr.) Rab., in South Africa as the cause of 'stem smut' in Rye.** (Translation.)—*S. African Dept. of Agric. Sci. Bull.* 76, 52 pp., 8 pl., 8 figs., 1 diag., 1 graph, 1929. [Received March, 1931.]

Flag smut of wheat (*Urocystis tritici*) [*R.A.M.*, iii, p. 577; x, p. 161] is stated to occur in a number of districts [which are enumerated] in the Western Province and Transvaal, South Africa. It is thought to have been probably introduced during 1915–16 on wheat imported from Australia for milling purposes. The disease causes heavy losses, up to 50 per cent. of the crop at times. No adverse effects were observed in chickens fed for 24 days continuously on heavily infected wheat plants chopped up and mixed with bran.

The optimum temperature for the germination of *U. tritici* spores was found to be 22° to 24° C., the process being hastened by pre-soaking for three days and by desiccation with sulphuric acid. The viability of the spores is retained for at least five years, at the end of which period up to 1·9 per cent. infection was obtained. In the soil the fungus retains its infective capacity for at least four years. Under South African conditions the disease is more prevalent in soils with a high moisture content than in those with a low one.

No evidence was obtained of the existence of physiologic strains of *U. tritici*, the South African form of which, however, appears to be more virulent than the American strain tested; the former produced 66·7 and 45 per cent. infection, respectively, on the Michikoff and Illini Chief varieties, while the corresponding figures for the latter were 32·6 and 21 per cent. The results obtained in the infection of crosses between Rieti (immune) and Gluyas (highly susceptible) and between Medeah and Kubanka II (same reactions) indicate that susceptibility to flag smut is a dominant character. The following varieties (in addition to the above-mentioned) appear to be immune: Blignaut, Nasionaal, and M'Saken; 24 were found to be highly susceptible, including Du Toit, Federation, and Red Egyptian, while a number of others [which are listed] were intermediate.

Various dusts, viz., Bayer, cuprite, germisan, copper carbonate, semesan bel, semesan jr., tillantin R, and tillantin B, gave good control of *U. tritici* in artificially infected Florence Gluyas seed, but some of these preparations considerably impaired germination; this was especially noticeable in the case of germisan, which reduced the number of germinating seeds from 225 to 3. The treatments further failed to give adequate protection against infection by spores in the soil.

Attention is drawn, apparently for the first time, to the presence in South Africa of stem smut of rye (*U. occulta*), on plants which are thought to have developed from seeds present in the hay

packing with articles imported from Germany [ibid., ix, p. 46]. Spores from the diseased plants at Stellenbosch University were inoculated into Cape rye seed, with the result that 295 out of 656 plants became infected, mostly in a very virulent form.

The bibliography comprises 67 titles.

BRESSMAN (E. N.). **Physiologic forms of bunt of Wheat and varietal resistance.**—Abs. in *Phytopath.*, xxi, 1, p. 108, 1931.

Ten standard wheat varieties, nine reported as resistant and one susceptible to bunt, were used as differential hosts in a three-year series of inoculation tests with 100 collections of *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] from widely separated sections of the United States and several foreign countries. The results indicated the presence of at least ten physiological forms, six of *T. foetens* and four of *T. caries* [*R.A.M.*, x, pp. 19, 302]. Practically all the wheat varieties formerly classed as resistant to this disease proved susceptible to one or more of these forms; for instance, White Odessa, Martin, Banner Berkeley, Albit, Regal, Sherman, Stephentshka, Cooperatorka, Hope, and Hussar are attacked by several. Ridit, although resistant to most physiologic forms of the smuts, was susceptible to some. Turkey × Bd. Minn. No. 48, Hohenheimer 'behaart' [bearded], and Hohenheimer 'unbehaart' [beardless] are fairly resistant to most of the forms but contracted some infection. Rye was susceptible to several of the forms. *T. secalis* is considered to be a form of *T. tritici* [ibid., vii, p. 159]. Hosar, a selection made by the writer from Woolman's hybrid, Hussar × Hohenheimer 'behaart', proved consistently resistant to all the forms of bunt used in the trials.

FLOR (H. H.). **Indications of heterothallism in Tilletia tritici.**—Abs. in *Phytopath.*, xxi, 1, p. 107, 1931.

In a series of field and greenhouse tests at the Washington Agricultural Experiment Station wheat seedlings were inoculated with one or more cultures from single primary sporidia of *Tilletia tritici* [*T. caries*]. Ten such monosporidial cultures inoculated singly into wheat seedlings produced no infection. Of six trials in which the seedlings were inoculated with a mixture of two such monosporidial cultures, infection was obtained in three, while in all three tests in which ten of the monosporidial cultures were mixed positive results were obtained. In no instance did infection occur on uninoculated plants.

VILKAITIS (V.). **Kietosios kviečių kūlės (Tilletia tritici (Bjerk.) Wint.).** [Bunt of Wheat (*Tilletia tritici* (Bjerk.) Wint.)]—*Kosmos*, [Lithuania], *1930*, pp. 359–369, 3 figs., 1930.

After a brief account of the symptoms of wheat bunt (*Tilletia tritici* [*T. caries*] and of the biology of the causal organism, the author gives some details of experiments conducted for the purpose of determining the effect of the disease on the growth of the host plant [*R.A.M.*, vi, p. 281]. The result of the tests [in which an unspecified wheat was used] showed that in the bunted plants the height of the haulms was reduced on the average by 25 per cent. and the length of the ears by 15 per cent., as compared with

healthy plants. The disease also increased tillering by about 49 per cent. Bunted plants were observed to be much more susceptible than healthy ones to attacks of yellow rust [*Puccinia glumarum*] [ibid., ix, p. 706].

SMITH (N. J. G.) & RATTRAY (J. M.). **Netblotch, spotblotch, and leaf-stripe diseases of Barley in South Africa.**—*South African Journ. of Sci.*, xxvii, pp. 341–351, 4 figs., 1930.

Notes are given on net blotch (*Helminthosporium teres*), spot blotch (*H. sativum*) [*R.A.M.*, ii, p. 59; v, p. 287], and leaf stripe (*H. gramineum*) [ibid., iii, p. 65; viii, p. 770] of barley, with special reference to South African conditions. *H. teres* and *H. gramineum* being more conveniently distinguished by the symptoms they produce [which are described] than by their spore forms, notes are given on the relations between these species and the host. In South Africa *H. sativum* differs from the other two organisms in the symptoms it produces, the appearance and size of its spores, its growth characters in culture, and its ability severely to infect wheat; its conidia are broadest near the middle and the maximum number of septa seen was 10, as compared with 11 in *H. teres* and 8 in *H. gramineum*. The older conidia of *H. sativum* are more darkly olivaceous and the walls are much thicker than in either of the other species. As collected in nature, spores longer than 100 μ were rare in *H. gramineum* but common in *H. teres*.

KOEHLER (B.). **Effect of time and rate of application of seed disinfectants on Oats and Wheat.**—Abs. in *Phytopath.*, xxi, 1, p. 127, 1931.

Tests were conducted for two years with formaldehyde dust (smuttox in 1929, corona oat dust in 1930) on two varieties of oats [*R.A.M.*, ix, p. 299]. Treatments made three months, one month, and one week before sowing all caused reductions in yield of grain as compared with those made the day before. Treatments with ceresan three months or one month before sowing also caused some diminution of yield. However, on seed infected by smut [*Ustilago avenae* and *U. kolleri*] all these treatments caused increases in yield ranging from 0·7 to 10·7 bushels per acre for formaldehyde dust and 3·9 to 14·9 for ceresan. Better results were obtained with 3 than with 2 oz. per bushel.

Wheat seed-grain infected by *Gibberella* [*saubinetii*] was treated with copper carbonate, extended copper carbonate, and ceresan, all of which gave increased yields of 2·4 to 11·7 bushels per acre. Equally good results were obtained with 2 and 3 oz. per bushel.

WINKELMANN (A.). **Neue Beizgeräte.** [New dusting apparatus.]—*Deutsche Landw. Presse*, lviii, 1, p. 5, 1 fig., 1931.

Full technical details are given of the construction and application of two new dusting apparatus for the disinfection of seed-grain, viz., Abavit-Beiztrommel (Meyer, Mainz), and Gross-Tillator 30 (F. Neuhaus G.m.b.H., Eberswalde), the latter not to be confused with Gross-Tillator Höchst [*R.A.M.*, ix, p. 328]. The Abavit-Beiztrommel is intended only for use with small quantities of seed-grain (15 kg. of rye or wheat, 10 kg. of oats or barley).

Calculating 30 to 40 revolutions per minute, the machine must be turned for ten minutes for effective mixing. The average quantity of dust adhering to the seed-grain after this process, followed by passage through the drill, was found to be 66·5 per cent. [cf. ibid., x, p. 288].

The Gross-Tillator 30 is a continuously working apparatus constructed to treat 12 to 30 cwt. of seed-grain per hour. Another machine (Gross-Tillator 12) is supplied by the same firm for the treatment of smaller quantities (8 to 12 cwt.). The average amount of dust adhering to 16 cwt. of wheat seed-grain after treatment in the Gross-Tillator 30 and subsequent passage through the drill was 57·5 per cent., the corresponding figure for 32 cwt. being 53 per cent. The average quantity of dust adhering to 19 cwt. of barley seed-grain after disinfection (without passage through the drill) was 68·75 per cent. In the case of Gross-Tillator 12, the average amount of dust adhering to 8 cwt. of wheat seed-grain after treatment and passage through the drill was 74·5 per cent., the corresponding figure for 12 cwt. being 70·6 per cent. The average quantity of dust adhering to 9 cwt. of barley seed-grain after treatment and passage through the drill was 53·16 per cent.

The results of comparative tests with Gross-Tillator 30 and 12 and the discontinuous machines, Ideal No. 1 and Primus A and B, showed that the quantities of dust adhering were approximately equal when the loads were suitably adjusted.

McCrea (Adelia). **The reactions of Claviceps purpurea to variations of environment.**—*Amer. Journ. of Bot.*, xviii, 1, pp. 50–78, 2 pl., 1931.

A comprehensive account is given of the writer's studies at Michigan University on the reactions of *Claviceps purpurea* to variations of environment. The strain used was isolated in 1922 from Spanish ergot. The best medium out of a number tested proved to be Leonian's agar [*R.A.M.*, iii, p. 544] with malt extract, using double quantities of the nutrients and 6 per cent. agar, on which a very profuse mycelial growth was obtained. Of the stimuli tested, oxygen exercised the most marked effect on mycelial growth besides increasing the size of the conidia and accelerating and enlarging the pseudosclerotia. The fungus was found to grow over a wide temperature range (18° to 28° or 30° C.). An abundant supply of moisture is necessary for profuse development. Sunlight produces an intense coloration of the mycelium to carrot red, greatly exceeding the faint trace of colour resulting from any of the other stimulants. The rays stimulating colour production were found to lie in the blue-violet region of the spectrum, the ultra-violet rays exerting no special action on the growth or reproduction of the fungus. Light was shown to increase the ergosterol content of the mycelium of *C. purpurea* in culture.

No true sclerotia were formed in culture, but the production of definite mycelial knots (pseudosclerotia) is a constant phenomenon in a properly nourished mycelium. These structures are thought to be possibly primordia of true sclerotia that failed to

reach their full development through lack of some essential condition. A partially sclerotioid mycelium is readily obtained on the above-mentioned standard medium. This tissue, however, does not develop the morphological characteristics of true sclerotia, nor does it pass through a stage analogous to the stroma formation and subsequent germination of the natural sclerotia. Experiments with paired cultures gave marked indications of homothallism in *C. purpurea*.

In the course of these studies it was demonstrated for the first time that this fungus develops in saprophytic culture the three chief active principles characteristic of the extracts made from the natural sclerotia, viz., ergotoxin, histamine, and tyramine, and that they are obtainable to a sufficient strength (amounting in some cultures to about three-fourths of a standard ergot extract of the U.S. Pharmacopoeia) to be of economic significance. Field experiments indicated that the parasitic culture of *C. purpurea* on field rye on a large scale would scarcely be practicable in southern Michigan.

MELHUS (I. E.) & DAVIS (G. N.). **Nodal infection with the Corn smut organism.**—Abs. in *Phytopath.*, xxi, 1, p. 129, 1931.

When 500 Golden Bantam sweet maize seedlings were inoculated with two opposite monosporidial suspensions of the smut fungus [*Ustilago zeae*: *R.A.M.*, x, p. 95] in carrot decoction with a surface tension of 47 dynes, 33 per cent. contracted infection. When the surface tension was changed to 344 dynes by the addition of fish-oil soap, 91 per cent. became infected. In the former case no smut boils developed on the lower nodes, while in the latter 40 per cent. produced them; 54·5 per cent. of the boils only became evident after the tasselling of the plants. When three inbred lines, reputed to be very resistant and showing an average of only 1·4 per cent. natural infection in the field, were inoculated with a low surface tension spore suspension, boils were produced on 35 per cent. of the plants. When the leaf sheaths were removed late in the development of the plant many infected axillary buds were found with little hypertrophied tissue. This infection is believed to have been due to spores dropping into the spiral whorls, visible swellings occurring only in those buds that became active through any cause.

ST. JOHN (R. R.) & TROST (J. F.). **Relation of seed quality to yielding ability and disease resistance in hybrid strains of Dent Corn.**—Abs. in *Phytopath.*, xxi, 1, p. 128, 1931.

Among 37 hybrids of Dent maize grown under conditions favouring abundant stalk and ear infection by *Diplodia zeae* [*R.A.M.*, x, p. 180 and next abstracts], plants raised from seed obtained from healthy individuals yielded, on an average, 4 per cent. more than those from seed from diseased plants. In paired comparisons the seed of healthy plants was superior to that of diseased in 84 out of 111 tests.

SMITH (G. M.) & TROST (J. F.). **Resistance in sweet Corn to Diplodia zeae.**—Abs. in *Phytopath.*, xxi, 1, pp. 128–129, 1931.

Comparative trials in Indiana in 1930 of 225 inbred and crossbred strains of sweet maize and 500 of the Dent group for resistance to *Diplodia zeae* under conditions favouring natural infection [see preceding and next abstracts] showed 10 per cent. disease in the former and 7·5 per cent. in the latter. Sweet maize, therefore, is inherently about as resistant as Dent to rotting by *D. zeae*. Sixty-five strains of sweet maize showed less than 5 per cent. ear infection, and 23 over 30 per cent. The incidence of infection in the inbred lines was greatly reduced by selection for disease resistance throughout the period of inbreeding. In a number of cases where both parents of single-cross hybrids were highly susceptible to ear infection, the progeny were virtually free.

SMITH (A. L.) & HOLBERT (J. R.). **Cornstalk rot and ear rot.**—Abs. in *Phytopath.*, xxi, 1, p. 129, 1931.

Stalk and shank tissues of nearly mature maize plants injured by exposure to low temperatures in field refrigeration chambers were found, in experiments conducted in Wisconsin, to be much more susceptible to infection through artificial inoculation with *Basisporium gallarum* [*Nigrospora sphaerica*: see next abstract] than those not so damaged. It was further observed that stalk and shank tissues of plants grown on old soil were more susceptible than those of comparable plants on new soil.

Marked differences in the relative resistance of stalk and shank tissues to infection through artificial inoculation by *Diplodia zeae* were found in both inbred and crossbred strains of maize [see preceding abstracts]. Stalks of maize plants grown on more productive soils were more resistant than those of comparable plants on less fertile soils.

REDDY (C. S.). **Basisporium dry rot of Dent Corn as related to temperature and cob reaction.**—Abs. in *Phytopath.*, xxi, 1, pp. 129–130, 1931.

From many experiments in which Dent maize seed infected by *Basisporium* [*gallarum* = *Nigrospora sphaerica*: see preceding abstract] was germinated at different temperatures and in which different strains of maize were germinated at the same temperature, it was apparent that severe injury occurred in the form of rotting when the temperature prevented early germination. No apparent injury occurred immediately after germination, so that there is no seedling blight stage in this disease. Susceptibility to the ear rot caused by *N. sphaerica* was found to be directly correlated with low acidity and resistance with high (48 per cent. infection at a cob value of P_H 5·9 to 6·3 compared with 0 at P_H 4·4 to 4·7).

REICHERT (I.) & HELLINGER (ESTHER). **Internal decline—a physiological disease of Citrus fruits new to Palestine.**—Reprinted from *Hadar*, iii, 10, 14 pp., 4 figs., 1930.

Details are given of a physiological disease of citrus observed for the first time in Palestine during the summer of 1930, though

probably not of recent origin. Citrons (*Citrus medica*), grapefruit, and occasionally oranges are affected.

Green citron fruits show yellow patches and yellow fruits orange-coloured ones. Grapefruit and oranges show watery green or reddish spots on the surface from which gum is subsequently exuded. Gum also occurs in the intercellular spaces and in the parenchymatous cells of both the grapefruit and citron fruits, as well as in the wood vessels and cells of the vascular bundles in the affected citrons and the twigs bearing them.

The disease was prevalent in three-year-old orchards on light sandy soil which had not received adequate irrigation. The symptoms on citron are similar to those of the internal decline or endoxerosis affecting lemons in California [*R.A.M.*, viii, p. 169], while those on grapefruit agree with the manifestations of a gumming disease investigated in Cuba by Earle and Rogers (*Ann. Rept. San Pedro Citrus Path. Lab.*, pp. 5–41, 1915) and in Florida by Fawcett (Citrus diseases and their control, [p. 439], 1926). The disease is attributed to a deficit of water owing to the poor water-holding capacity of the soil and the excessive transpiration of the leaves during extreme heat. The exudation of gum on the surface of grapefruit and orange, but not of citron, is attributed to the much thinner rind of the former. Control measures should be based on the provision of sufficient moisture by improving the physical structure of the soil with organic manure, by wind breaks, overhead irrigation, and anything leading to a vigorous development of the root system.

STAHEL (G.) & BÜNZLI. **Nieuwe onderzoekingen over de zeefvatenziekte (phloeem necrose) van de Koffie in Suriname.** [Recent investigations on the sieve-tube disease (phloem necrosis) of Coffee in Surinam.]—Reprinted from *Indische Mercuur, 1930*, 42, 12 pp., 1930.

Further investigations have been conducted on phloem necrosis of coffee in Surinam [*R.A.M.*, vii, p. 509]. The affected bushes were situated chiefly on fairly high ground. Infection rapidly spreads from one row of bushes to another, but may be arrested by a deep, wide trench kept continually full of water. It was hitherto believed that phloem necrosis is confined to trees of fruit-bearing age, but recently it has been found among younger ones (two years old) in which the stem base and the tap-root appear abnormally thickened.

Gumming of the sieve-tubes is not the primary symptom, as immediately on their formation from the cambium they show multiple division into three to eight cells without gum. The divided sieve-tube is not appreciably larger than a normal one, since the phloem parenchyma remains unaltered and hence there is no room for extension. The sieve-tube is usually divided by more or less tangentially directed walls, sometimes by radial ones, and each of the resulting small vessels has its own sieve plate, all those of the group corresponding to a single normal vessel being at the same height. The width of the zone of sieve-tubes undergoing multiple division varies with the season, being most extensive during the rains; with the advent of the dry period gumming

rapidly takes place. At the end of August or beginning of September, when most of the trees die, this zone is quite narrow or has altogether disappeared in the necrotic tissue. The necrotic cell groups form sparkling yellow clumps impregnated with wound gum and staining bright red with phloroglucine and hydrochloric acid. In the earlier stages of the disease there is an outer zone of tangentially flattened sieve-tubes formed before the tree became infected. The sieve-tubes of this outer zone do not show multiple division but become obstructed by gum in the same way as those described above. When the gummed, divided sieve-tubes can be traced out as far as the cortex, the tree is suffering from a chronic, progressive form of the disease, having probably been infected at the beginning of the rains. Acute cases, on the other hand, are characterized by a narrow zone of living divided sieve-tubes, surrounded by a narrow zone of gummed ones of the same type, which in its turn is bordered by a wide zone of gummed but otherwise normal sieve-tubes. Such cases occur almost exclusively at the beginning of the dry season. The gumming of the divided sieve-tubes, therefore, is dependent on the amount of moisture; where this is plentiful the sieve-tubes remain alive much longer than in times of water shortage. In chronic cases the fine water-absorbing roots at the tips of the longer ones are mostly found to be dead in the rainy period, while those attached to the shorter roots nearer the stem are still living; in the dry season, however, these often die also. In trees showing the first microscopic symptoms of infection near the end of the rainy period, the divided sieve-tubes die shortly after formation, as also do the small roots from lack of nourishment. Dark green trees in full leaf shrivel all at once, the dry leaves remaining attached to the tree. Temporary recovery by the formation of a new cambium in the bark outside the zone of gummed sieve-tubes, and the development from this of normal sieve-tubes, has been observed; the thickening of the stem bases and tap-roots is due to this phenomenon.

The sieve-tubes undergoing multiple division were found to contain numerous flagellates of the *Phytomonas* [*Leptomonas*: ibid., i, p. 309] type, while in some cases round Leishmaniform bodies were also observed. The species found in the coffee sieve-tubes is stated to be much smaller than *P.* [*L.*] *davidi*, and can only be examined in sections of 10 μ or less in thickness. The disease is thought to be undoubtedly spread by means of sucking insects feeding on the phloem.

In Surinam phloem necrosis occurs on *Coffea arabica*, *C. liberica*, *C. abeocuta*, *C. canephora*, and *C. uganda*. The disease is also reported to be present in British Guiana. Presumably it has spread from some indigenous forest plant to the introduced coffee. So far the only control measures to be recommended are the immediate removal of diseased bushes and the establishment of seed-beds preferably on virgin soil at a distance from centres of infection. The sites formerly occupied by infected trees should be left fallow for some months under shade.

A form of chlorosis, apparently distinct from phloem necrosis, was observed among poorly developed coffee bushes on badly drained sites and on soils with a high lime content where *Wedelia*

trilobata is used as a green manure and *Hevea* [*brasiliensis*] as a shade tree. In these cases there is no trace of gumming or multiple division in the phloem.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1930.—113 pp., 1931.

The following items of phytopathological interest occur in this report. Efforts are being made in the Central Provinces to push the rapid extension of the wilt [*Fusarium vasinfectum*] resistant strain (No. 262) of *Gossypium verum* [*R.A.M.*, x, p. 103], the lint of which is stated to be far superior in spinning qualities to that of the local Oomras. It is anticipated that nearly 1,000,000 acres of *G. verum* will be grown next year, at an extra profit to growers of at least Rs. 10 [15*s.*] per acre. A cross between Dharwar 1 and Dharwar 2, named Jayawant, also shows a high degree of resistance to wilt, and the same is true of a cross between Dharwar 1 and Wagale.

FAHMY (T.). **Étude de la pénétration du champignon Fusarium vasinfectum (Atk.) var. aegyptiacum T. Fahmy dans les racines du Cotonnier.** [A study of the penetration of the fungus *Fusarium vasinfectum* (Atk.) var. *aegyptiacum* T. Fahmy in Cotton roots.]—Thesis 881, Université de Genève, 70 pp., 3 col. pl., 28 figs., 1930.

In this detailed account of further investigations into the cotton wilt caused in Egypt by *Fusarium vasinfectum* var. *aegyptiacum* [*R.A.M.*, vii, p. 318], the author states that in the F_1 generation the hybrid of a susceptible and a 'refractory' parent (i.e., a parent which does not contract the disease at all) is itself refractory; the F_2 generation gives a segregation of 75 per cent. plants apparently refractory and 25 per cent. susceptible.

To ascertain if any connexion exists between attacks of wilt and those of sore shin (*Rhizoctonia* sp.) [ibid., viii, p. 570], seed of the susceptible Sakel strain Sakla 3 and refractory Ashmouni strain Giza 7 was sown in pots of sterilized soil inoculated with the wilt and the sore shin organisms, respectively, and with a mixture of the two, as well as in uninoculated soil. After ten days, most of the seedlings in the *Rhizoctonia*-inoculated soil and in that inoculated with the mixed organisms developed sore shin. Those in the soil inoculated only with the *Fusarium* showed no wilt until the susceptible seedlings were one month old.

Sakla 3 seedlings grown in test tubes in Detmer agar inoculated with an aqueous suspension of the spores of the *Fusarium*, showed after four days a dark brown discoloration of the root cap, which gradually spread and became darker until, at the end of a fortnight, the whole surface of the roots had turned nearly black. The roots of the controls showed no discoloration. Infection of the region of the root cap progressed by four stages: (1) the development of the fungus on the cap before penetration of the root tissues, a stage which lasted about four days; (2) penetration into the root tissues near the cap; (3) invasion of these tissues; and (4) destruction of the cap and part of the root. The sides of the cap are more readily infected than the apex. The fungus then

progresses inwards by forming cavities in the tissues; the attacked roots first rot near the cap and finally the lower parts become completely disintegrated. After reaching the vascular bundles the fungus continues its progress within them to the top of the plant.

The death of the host appears to be due to the rotting of the young roots, but sometimes an infected plant can produce roots which escape attack, especially in the lower levels of the soil, which are almost free from the fungus. The plant may thus reach maturity in spite of the presence of the fungus in most of its vessels.

A cultural study [details of which are given] of the fungus showed that it prefers nitrate rather than ammonium as a source of nitrogen, and that it grows on Detmer agar in the absence of cellulose, hemicellulose, starch, or sugars. The evidence obtained indicated that the fungus lives on the normal food supply circulating in the host and that its parasitic nutrition is limited essentially to the utilization of the middle lamella, though it also obtains other products by osmosis. The essential pathological significance of the fungus lies in the rot it produces in the root tips. From the pericycle of infected roots new rootlets are put out, which in their turn become invaded.

EZEKIEL (W. N.), TAUBENHAUS (J. J.), & FUDGE (J. F.). **Nutritional studies on Phymatotrichum omnivorum.**—Abs. in *Phytopath.*, xxi, 1, p. 120, 1931.

Phymatotrichum omnivorum is stated to grow readily in synthetic media, even the sclerotial stage developing in cultures in which ammonium nitrate was the source of nitrogen and dextrose that of carbon. The heaviest growth was secured with a relatively large supply of dextrose and a lesser amount of some source of nitrogen, ammonium nitrate being the most favourable of those tested. Phosphate was essential, also potassium or magnesium or possibly both. Iron, chlorine, and sulphate were omitted without much effect. At 28° to 29° C. the growth curves reached a peak in five weeks with a substratum high in dextrose and in three weeks with a low dextrose content. The media became increasingly acid as the colonies developed, but ultimately tended towards alkalinity as the mycelium degenerated.

LEFEBVRE (C. L.). **A destructive fungous disease of the Corn borer.**—Abs. in *Phytopath.*, xxi, 1, pp. 124–125, 1931.

During the past year an epidemic of *Beauveria bassiana* [*R.A.M.*, x, p. 310] occurred on larvae of the European corn borer [*Pyrausta nubilalis*] at the Arlington (Massachusetts) laboratories, mortality among the insects amounting to as much as 90 per cent. in lots imported from Manchuria [cf. ibid., ix, p. 716]. This is believed to be the first record of the fungus on the corn borer in the United States. In laboratory tests, 100 per cent. larval mortality is obtained within two days by inoculation with conidia of *B. bassiana*, while *B. globulifera*, the common American species, only killed four larvae in seven trials of ten larvae each. Preliminary field tests indicated that at least partial control of the corn borer can be obtained by dusting the spores of the fungus on

infested fields. The infected larvae first turn pink (hence the name 'pink disease') and soon become mummified; after a few days a white mycelial outgrowth is apparent, which turns to a creamy, powdery spore mass owing to profuse spore formation. On artificial media *B. bassiana* is characterized by a flat, mealy, pulverulent growth, forming abundant conidia in several days; *B. globulifera* produces an elevated, cottony, floccose growth and does not form conidia for some weeks. In Van Tieghem cells the spores of *B. globulifera* produce much more extensive germ-tubes (which branch profusely throughout the droplet) than *B. bassiana*. The latter does not readily lose its virulence on artificial media.

PUNTONI (V.). **Pluralità specifica dell' Actinomyces bovis.** [Plurality of species of *Actinomyces bovis*.]—*Ann. d'Igiène*, xli, 1, pp. 1–28, 1 col. pl., 8 figs., 1931.

This is an extended account of the author's researches on 22 strains of actinomycetes classified under the collective name of *Actinomyces bovis* [*R.A.M.*, ix, p. 525]. Of these 12 were identified with *A. sulphureus*, 7 with *A. albus*, 1 with *A. chromogenes*, 1 with *A. albidoflavus*, and 1 with *A. carneus*.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Contribution à l'étude des mycoses osseuses primitives: un nouveau cas d'actinomycose osseuse à grains jaunes sans massues.** [Contribution to the study of the primary osseous mycoses: a new case of osseous actinomycosis with yellow grains devoid of clubs.]—*Bull. Acad. Méd.*, Sér. 3, civ, 33, pp. 243–246, 1930.

Full clinical details are given of the case of a 13-year-old girl at Strasbourg who suffered from a swelling of the tibiotarsal region of the left foot. A fungus was isolated and identified as a species of *Actinomyces* [cf. *R.A.M.*, ix, p. 592] characterized by branched, dovetailed hyphae measuring up to 1·5 mm. by 0·4 to 0·5 μ and sometimes bearing chains of 8 to 10 arthrospores, 0·7 to 0·9 μ in diameter, but without clubs. In the first place, the only medium on which the fungus could be obtained in pure culture was potato extract agar with glucose; subsequently it grew readily on various standard media, producing white to whitish-yellow colonies of a plaster-like consistency exhaling a strong mouldy odour. White of egg, serum, and milk were coagulated, gelatine and starch liquefied. The optimum temperature for growth was 35° C. and the most favourable hydrogen-ion concentration P_H 6·3.

JONES (J. W.) & ALDEN (H. S.). **Maduromycotic mycetoma (Madura foot). Report of a case occurring in an American negro.**—*Journ. Amer. Med. Assoc.*, xcvi, 4, pp. 256–260, 8 figs., 1931.

From a mycetoma containing soft, smooth, white or pale yellow grains on the right foot of a negro at Atalanta, Georgia, the writers isolated a fungus characterized by white (later grey, dark green, or black), cottony colonies on Sabouraud's media, the best growth on which occurred at 37·5° C. The slender, segmented hyphae (2·5 μ in width) contain numerous brown granules. Ter-

minal oval conidia, 7 to 10 by 3 to 5 μ, were borne on long, hair-like conidiophores. Spore-containing perithecia were formed in some of the older cultures but no definite sclerotia. No chlamydospores, arthrospores, or spindle-shaped bodies were observed. Inoculation experiments on rabbits merely produced an inflammatory reaction of the eye, from which the organism was not recovered.

The fungus was identified (in conjunction with F. D. Weidman) as *Scedosporium apiospermum* [*R.A.M.*, ix, p. 782] or *S. sclerotiale*.

MUENDE (I.). **Observations on Monilia.**—*Brit. Journ. of Dermatology*, xliii, 1, pp. 3–19, 1931.

The writer summarizes his observations, made at St. John's Hospital for Diseases of the Skin, on the rôle of *Monilia* [*Candida*] *albicans* and *M.* [*C.*] *pinoyi* in the causation of skin and nail diseases [*R.A.M.*, x, p. 312]. For the culture of these organisms the most suitable medium was composed of 0·2 gm. agar, 0·05 gm. sugar (dextrose, levulose, maltose, etc.), and 0·2 c.c. bromocresol purple as indicator, to 5 c.c. Locke's solution; 0·5 c.c. rabbit serum may be added if desired. It is concluded that these fungi play a very important part in the causation of the above-mentioned pathological conditions, and that they are also capable of inducing secondary allergic dermatitis. Reference is made to a number of recent investigations in the same field.

BAUDET (E. A. R. T.). **Sur une souche d'Aleurisma lugdunense isolée de la peau d'un dromadaire.** [Note on a strain of *Aleurisma lugdunense* isolated from the skin of a dromedary.]—*Ann. de Parasitol. Humaine et Comp.*, viii, 6, pp. 628–637, 3 figs., 1930.

A brief account is given of a fungus which developed in one of the cultures isolated from ringworm lesions on a young dromedary [*R.A.M.*, ix, p. 781], and which was found to be morphologically and culturally identical with *Aleurisma lugdunense* [ibid., iv, p. 604]. The only difference was that a few of the first subcultures on very acid media developed a pink pigmentation in the substratum, which, however, disappeared in further subcultures. When a small piece of a culture of the original *A. lugdunense* was placed in a drop of hydrochloric acid it assumed a red colour. This pigmentation appears to be a transitory peculiarity of the genus *Aleurisma*, since *A. arloingi* [loc. cit.] also produces a bright red pigment on certain media. The author also was unable to find, either in the cultures of his strain or in those of the original one studied by Massia and Grigorakis, the chains of 5 to 15 spores and the racquet-shaped cells described by these writers. The dromedary strain of *A. lugdunense* was shown to be non-pathogenic to the guinea-pig.

MORSTATT (H.). **Weiteres über Blattkrankheiten der Sisalagave.** [Further notes on leaf diseases of the Sisal Agave.]—*Der Tropenpflanzer*, xxxiv, 1, pp. 5–13, 1931.

Full details are given of a leaf disease of sisal [*Agave rigida* var. *sisalana*] which, according to information communicated to the

Kolonial-Wirtschaftliche Komitee in Germany, suddenly developed near the Usambara mountains, Tanganyika, in September, 1930 [cf. *R.A.M.*, x, p. 31]. The leaves round the heart, before they were ripe for cutting, developed a white discoloration extending the full width of the leaf blade and for 10 to 25 cm. in length on the lower side; sometimes isolated green patches remained dotted over the white area. The disease appeared literally over-night on plants in full vigour, weakly individuals and neglected stands being exempt. The discoloration always developed above the middle of the leaf and extended upwards and downwards. In the course of a week the diseased areas turn from pale green to brown or blackish, partly due to the exudation and hardening of the sap. In severe cases the leaves become dry and hard and the whole tip gradually dies. The symptoms occur only on 6 to 10 of the leaves situated at an angle of 60° to 75° between the ripe and the heart leaves; according to one report the lesions face almost exclusively in a westerly direction. The disease affected chiefly $1\frac{1}{2}$- to $2\frac{1}{2}$-year-old stands, sometimes occurring over areas of up to 100 hect. The epidermis of the leaves is not destroyed but merely loosened, and the white appearance is due to an underlying layer of air.

Most observers attribute the phenomenon to sun scorch, which occurred under similar meteorological conditions (dense ground fog in the early morning, with a perfectly clear sky and intensely hot sunshine) in 1904, 1905, 1913, and 1922. This particular type of disturbance, however, characterized by conspicuous white lesions, has not previously been described, and possibly the very abrupt changes of weather in 1929 and 1930 (extreme dryness followed by excessively heavy rains) may have weakened the constitution of the plant, the original home of which is in a uniformly dry climate. The conclusion reached by the expert, Prof. Eichinger, who inspected the plants, is that the primary cause of the trouble was a chill due to the fog.

STANER (P.) & VERPLANCKE (G.). **Étude d'un état pathologique du Sisal au Congo Belge.** [A study on a pathological condition of Sisal in the Belgian Congo.]—*Bull. Inst. Roy. Colon. Belge*, i, 2, pp. 279–300, 3 pl., 1 graph, 1930.

Sisal (*Agave rigida* var. *sisalana*) growing at Inkisi, Belgian Congo, recently developed a yellow leaf spot disease. During the dry season the leaves showed a characteristic marbling, red, necklace-like marks appeared at the base, and the leaves bent over at this point. Pale intumescences were also present, together with indurations and vitreous areas, while gummy drops were noted on the lower part of certain leaves. In the wet season the under surface of certain leaves, especially at the base of the blade, bore dark, deep lines. When the leaves were broken longitudinally in these parts, it was found that groups of parenchymatous cells had become vitreous. During the later stages the affected parts turned yellow and a red internal decomposition of the pulp occurred below the intumescences, which involved the fibres, and was marked by a longitudinal furrow on both surfaces. The marbling was not invariably accompanied by the vitreous areas.

Examination showed that the vitreous areas were composed of

isodiametric or elongated meristematic cells devoid of chlorophyll and with undifferentiated membranes. There was present also a zone of cellular necrosis, consisting of one or two layers which had collapsed owing to pressure due to the very rapid increase of neighbouring cells; in some cases the cells became hypertrophied without causing necrosis.

Analysis demonstrated that the soil in which the plants were growing was deficient in nitrogen, potassium, and phosphates. When potassium was absent from the complete manurial dressing peculiar white spots appeared on the leaves.

The view at first adopted that the condition was due to a filterable virus [*R.A.M.*, ix, p. 316] was abandoned after inoculation experiments had all given negative results, and it is considered that Braun's surmise that the leaf spot of sisal observed by him in German East Africa (*Berichte über Land. u. Forstw. in Deutsch Ost-Afrika*, iii, 4, pp. 143–166, 1908) was due to the effect of intense heat on already weakened plants to a large extent explains the occurrence.

The authors conclude that the condition is due to unfavourable physiological and climatic factors, such as poor soil and a particularly long dry season in two successive years.

Flax facts.—*Minnesota Extens. Special Bull.* 128, *Montana Extens. Bull.* 107, *North Dakota Extens. Circ.* 90, *South Dakota Extens. Circ.* 293, 32 pp., 1 fig., 1930. [Received April, 1931.]

In this paper, under the joint authorship of E. C. Stakman, H. A. Rodenhiser, H. L. Bolley, and a number of other experts, recommendations are made for the use of Buda, Redwing, and Bison varieties of flax seed on account of their resistance to wilt [*Fusarium lini*: *R.A.M.*, x, p. 109], or failing these, Linota, Chippewa, and North Dakota Resistant No. 14. Winona and the Argentine varieties are unsuitable for Minnesota conditions, the former because of its susceptibility to rust [*Melampsora lini*: ibid., x, p. 108] and the latter on account of their liability to Pasmo [*Phlyctaena linicola*: see above, p. 364], which appears to be borne to some extent on the seed.

JANKOWSKA (KRYSTYNA). **Spostrzeżenia nad grzybem szklarniowym (Moniliopsis aderholdi Ruhl.).** [Observations on the greenhouse fungus (*Moniliopsis aderholdi* Ruhl.).]—*Mém. Inst. Nat. Polonais d'Écon. Rur. à Puławy*, xi, 1, pp. 61–69, 2 figs., 1930. [English summary.]

This is a brief account of the author's study of the biology of *Moniliopsis aderholdi* [*R.A.M.*, ix, pp. 133, 667] which is stated to have done considerable damage in 1927 and 1928 to seedlings of *Begonia*, *Lobelia*, and *Petunia* in glasshouses at Puławy, Poland. In pure culture the fungus developed best on solid media containing mineral salts and glucose, but otherwise showed little discrimination in the choice of its substrata, developing freely under adequate conditions of humidity and temperature on or in blotting paper, lime tree leaves, sterilized water, and the like. It was also shown to be able to grow within wide limits of hydrogen-ion concentration, with an optimum between P_H 5·8 and 6·2. Its optimum

temperature for growth was 25° C., with a minimum at 6° to 7°, but the rapidity of growth at the various temperatures tested decreased as the age of the cultures increased.

The results of the investigation indicate that M. *aderholdi* probably exists as a saprophyte in nature, and that it only becomes parasitic under conditions of high humidity and high temperature, such as are prevalent in greenhouses. The pseudosclerotia were found to retain their viability long enough to tide the fungus over periods of cold and dryness, which are unfavourable for the growth of the vegetative mycelium; they are also very resistant to low temperatures, since a prolonged exposure to −14° C. did not impair their vitality. The paper terminates with recommendations for the control of the fungus in greenhouses, the chief among which are a strict sanitation of the houses and seed-beds, adequate ventilation, avoidance of sowing the plants too densely, covering the seeds with heat-disinfected sand instead of ordinary earth, and watering the plants with water free from contamination.

GREEN (D. E.). **Experiments and observations on the incidence and control of the black spot disease of Roses.**—*Journ. Roy. Hort. Soc.*, lvi, 1, pp. 18–30, 4 pl., 1931.

Details are given of experiments from 1928 to 1930 at Wisley, Surrey, the results of which indicated that the incidence and severity of the black spot disease of roses (*Diplocarpon rosae*) [*R.A.M.*, viii, p. 648] were not appreciably reduced by the application as fertilizers of potassium sulphate, ammonium sulphate, and superphosphate, either singly or combined, to plots of a very susceptible (Juliet) and of a fairly resistant (Christine) variety. Of the four fungicidal sprays and one dust which were tested, 4–4–50 Bordeaux mixture alone proved to be very effective in the control of the disease, but was somewhat objectionable from an ornamental point of view. Burgundy mixture (5–5–50) was unsuitable owing to its injurious effect on the foliage.

WOLF (F. A.). **Diaporthe blight of Larkspur.**—*Phytopath.*, xxi, 1, pp. 77–81, 2 figs., 1931.

Larkspurs (*Delphinium ajacis*) in North Carolina were observed to be affected, in the spring of 1929, by a hitherto undescribed disease which is designated *Diaporthe* blight.

The lower leaves of plants in the flowering stage become brown and dry, and brown lesions are found near the stem bases, ultimately extending upwards several inches above soil level and downwards into the root system. Scattered dark, spherical to ellipsoid, uniloculate pycnidia of the *Phomopsis* type, measuring 100 to 150 μ in diameter, are found in the lesions, while the crown and uppermost roots are enveloped in a cottony weft of mycelium during rainy periods. Towards the end of the growing season scattered pycnidia appear on the capsules, some of which are blighted while others bear apparently normal seed. Probably the seed from diseased capsules serves as a means of introducing the blight into new localities. The pycnidia produce hyaline, oval A spores, measuring 8 to 10 by 3·54 μ, which are capable of germina-

tion, and thread-like, hooked or curved, non-germinable B or stylospores, 20 to 30 by 0·75 μ.

On overwintered stems a perithecial stage of the *Diaporthe* type developed. The perithecia occur singly, immersed, with elongated, erumpent beaks 300 to 400 μ long. The diameter of the basal portion is 200 to 225 μ and that of the beaks 75 to 100 μ. The asci measure 45 to 50 by 9 to 10 μ, and contain hyaline, uniseptate, guttulate, biseriate ascospores, 10 to 12 by 3 to 3·5 μ. *Phomopsis* pycnidia developed in about a fortnight from ascospores sown on potato agar or sterilized larkspur stems, and further evidence of the genetic connexion between the two stages, as well as of the pathogenicity of the fungus, was obtained by inoculation experiments with macerated perithecia and with a conidial suspension from ascospore cultures. Small brown lesions developed on all the inoculated plants in 7 to 8 days, followed by the formation of *Phomopsis* pycnidia within another 10 days. The larkspur blight fungus appears to correspond with *D. arctii* (Lasch) Nit., a group species occurring on the stems of various ornamental plants, and it is accordingly identified with this organism.

Passalacqua (T.). **Sopra l'alternariosi del Garofano.** [On alternariosis of Carnation.]—*Riv. Pat. Veg.*, xx, 5–6, pp. 133–135, 1930.

In the autumn of 1929, young carnations in nurseries near Palermo developed an ashy-white discoloration of the leaves, stems, and nodes. In the affected parts (which were confined to the outer tissues) a dark brown, septate mycelium was present, with tufts of conidiophores bearing brown, catenulate conidia with 5 to 9 transverse septa as well as longitudinal ones and measuring 30 to 100 by 10 to 30 μ. This fungus was identified as *Alternaria dianthi* [*R.A.M.*, iii, p. 652; ix, p. 362]. Abundant fructifications of a *Pleospora* were also noted; in the appearance of the perithecia and in its spore dimensions this organism resembled *P. herbarum*, though the asci attained 130 μ in length.

In culture *A. dianthi* produced spores measuring 30 to 90 by 10 to 20 μ with 4 to 7 transverse septa; the *Pleospora* was not obtained in culture. Artificial inoculations of young carnations under optimum conditions of temperature and moisture gave positive results on old basal leaves only.

The attack coincided with a rainy spell, but nearly all the plants recovered later. It is concluded that in the climate of Palermo *A. dianthi* is a weak parasite which attacks plants growing under unfavourable conditions or invades only the oldest parts. In all probability, *P. herbarum* is its ascigerous stage.

Dolk (H. E.) & Van Slogteren (E.). **Über die Atmung und die Absterbeerscheinungen bei Hyacinthenzwiebeln bei höheren Temperaturen im Zusammenhang mit der Bekämpfung der Gelbkrankheit.** [On respiration and dying-off manifestations in Hyacinth bulbs at high temperatures in relation to the control of yellow rot.]—*Gartenbauwissensch.*, iv, 2, pp. 113–158, 1 fig., 1 diag., 2 graphs, 1930.

The control of yellow rot of hyacinth bulbs (*Pseudomonas hyacinthi*) in Holland by exposure to hot air [*R.A.M.*, vii, p. 174]

is accompanied by a certain amount of injury due to the interference with intramolecular respiration on account of insufficient aeration. The pathological conditions thus induced in the bulb may take the form either of a decay of the outer scales, or of the death of the bud from lack of oxygen in the interior caused by the respiration of bacteria developing on the surface.

The intensity of respiration was found to increase in proportion to the rise of temperature, reaching an optimum at about 40° C. It was shown by experiments [the results of which are tabulated and fully discussed] that respiration is reduced if there is a low oxygen concentration. Respiration was found to proceed independently of partial oxygen pressure down to about 14 per cent., below which the oxygen concentration becomes a limiting factor and respiration sinks until at a concentration of 0 per cent. it ceases entirely.

The increased atmospheric humidity incidental to defective ventilation is accompanied by a considerable increase in the emission of carbon dioxide, due to the development of bacteria on the surface of unsterilized bulbs. This bacterial development (stated to be common after a temporary rise of temperature) involves a protracted increase of respiratory intensity, which has been incorrectly attributed in the literature to the stimulatory effect of heat. The increased respiration after immersion in hot water for forcing purposes may also be simulated by bacterial development.

The fumigation of the bulbs with 20 per cent. formalin or ozone for 8 to 32 hours was found to prevent the development of the above-mentioned injuries.

NICOLAS (G.) & AGGÉRY (Mlle). **Nouvelles observations sur Phyllosticta daphniphylli Nicol. et Agg. et aggravation de son action par des bactéries.** [New notes on *Phyllosticta daphniphylli* Nicol. & Agg., and on the intensification of its action by bacteria.]—*Comptes rendus Acad. des Sciences,* cxci, 25, pp. 1376–1378, 1930.

Observations in 1930 showed that, besides defoliation, *Phyllosticta daphniphylli* [*R.A.M.*, viii, p. 107] also produces reddish-brown cankers on twigs of *Daphniphyllum glaucescens,* in which it apparently lives over winter in the form of pycnidia. After penetrating the epidermis the mycelium more or less completely invades all the tissues of the twigs up to the pith, and also enters the vessels in which a red gum is formed. Its further development is, however, generally limited by the formation of a cork layer in the host tissues. In some of the cankers observed, the fungus was found associated with two forms of bacteria, which were also found alone in lesions on the twigs at the level of leaf scars. In the latter case the bacteria, which are believed to gain entry to the host tissues through the leaf scars, were obviously parasitic; their development did not cause any protective reaction on the part of the host and they moved freely through the vessels to the leaves, the normal development of which they hindered. When associated with *P. daphniphylli*, however, the further progress of the bacteria was stopped by the above-mentioned cork layer.

WEIMER (J. L.). **Alfalfa dwarf, a hitherto unreported disease.**—*Phytopath.*, xxi, 1, pp. 71–75, 1 fig., 1931.

A lucerne disease somewhat resembling wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 192], but apparently distinct, is reported to be very prevalent and destructive south of the Tehachapi Mountains, California, where the annual losses from this source are estimated to reach thousands of dollars. Not only is the life of the stand curtailed but the yield is substantially reduced, especially in the later stages. The disease usually begins along irrigation ditches or where the soil moisture is highest and spreads from these areas until most or all of the field is involved. Affected plants gradually become smaller until they finally succumb without showing any other marked top symptom; the name 'dwarf' is considered to be more applicable to this disturbance than the term 'little leaf' used by the growers.

The symptoms of dwarf are fully described and compared with those of bacterial wilt. Both diseases cause a marked stunting of the tops in the advanced stages, and in both the stems become fewer, shorter, and more spindling after each cutting. In bacterial wilt, however, the stunted, irregular leaves are usually paler than those of healthy plants, whereas in dwarf disease they remain practically normal in shape and colour. The root symptoms of both diseases are very similar, beginning with a slight yellowing of the wood just below the bark which spreads until the entire active part of the xylem is more or less completely involved. The reddish-brown lesions in the bark and wood of wilted roots have never been observed in those of plants affected by dwarf, nor are bacteria present in the latter case.

WEIMER (J. L.). **Alfalfa mosaic.**—Abs. in *Phytopath.*, xxi, 1, pp. 122–123, 1931.

A mosaic disease of lucerne prevalent in California has been shown to be readily transmissible by aphids (*Illinoia* [*Macrosiphum*] *pisi*), but not by mechanical means [cf. *R.A.M.*, ix, p. 121]. A disease of lucerne recently observed in Wisconsin by F. R. Jones is evidently identical with the Californian trouble. It occurs chiefly during cool weather, especially in the spring before the first cutting. The damage caused by this type of mosaic is very slight, being practically restricted to inconspicuous dwarfing in the most seriously affected plants, which are apparently never killed.

YARWOOD (C.). **Powdery mildew of Red Clover.**—Abs. in *Phytopath.*, xxi, 1, p. 122, 1931.

The powdery mildew of red clover (*Erysiphe polygoni*) [*R.A.M.*, ix, pp. 228, 537] is stated to be readily grown on excised leaflets removed in the late afternoon and floated on a 6 per cent. sucrose solution. The growth of the fungus was found to be favoured by a high carbohydrate content of the leaflet. The incubation period of the disease is about six days. A correlation was established between the severity of mildew and yield. A wide range of resistance and susceptibility was found in seed from the same parent. Two physiologic forms of the mildew have been separated,

differing markedly in their reactions on individual plants. Up to 97 per cent. spore germination has been observed; the spores are relatively resistant to the action of certain chemicals but sensitive to sulphur. Germination may occur in a fairly dry atmosphere. The germ-tubes are negatively phototropic. Spores showing little or no tendency to germinate can sometimes be induced to do so profusely on sucrose solutions. Reduced germination often occurs on leaflets of a resistant host.

WESTON (W. H.). **Sclerospora butleri, a new species from Nyasaland.**—Abs. in *Phytopath.*, xxi, 1, p. 125, 1931.

Sclerospora butleri n. sp., collected on the wild grass *Eragrostis aspera* in Nyasaland, is characterized by oospores measuring 17 to 25 μ in diameter (smaller than any yet known), while the surface of the dark amber oogonial wall is marked by pallid, rounded protrusions, 2 to 3 μ in width and 2 to 5 μ in height, instead of being roughly patchy or ridged, angled, and polygonally-faced, as in other species. The host shows the well-known shredding of the leaves which are infested by the resting spores only [cf. *R.A.M.*, ix, p. 320]. So far the fungus is known only from the above-mentioned collection on *E. aspera*, but the host has a wide range, occurring throughout Africa even to elevations of 2,000 m. and extending into southern India.

DIEHL (W. W.). **Conidial fructifications in Balansia and Dothichloe.**—*Journ. Agric. Res.*, xli, 11, pp. 761–766, 2 pl., 3 figs., 1930.

A brief description is given of conidial stages which have been observed by the author in species of *Balansia* and *Dothichloe* parasitic on grasses, and which hitherto were unknown or rarely recognized. An amerosporous conidial fructification, similar to that of *Epichloe*, was found in *Balansia hypoxylon* [*R.A.M.*, x, p. 35] in nature, and developing on ascogenous stromata of *Dothichloe atramentosa* and *D. aristidae* under certain humidity conditions. In the two last-named species, the formation of the ascogenous stromata is preceded in nature by an effuse scolecosporous type of conidial fructification, microscopically indistinguishable from that in *Ephelis mexicana*, the ascogenous stage of which is referable to *Balansia trinitensis*. No amerosporous conidial stage was found for *E. mexicana*. The presence was noted of branched conidiophores in all the scolecosporous fructifications.

In terminating the author states that the character and sequence of the conidial fructifications in *Balansia* and *Dothichloe* show definite correlations which suggest their recognition in the taxonomic interpretation of these fungi.

PIERSTORFF (A. L.) & YOUNG (H. C.). **Results with new sulphur dusts for Apple scab control.**—Abs. in *Phytopath.*, xxi, 1, p. 131, 1931.

Two new dusts, viz. 85–15 sulphur-dry lime-sulphur, and 85–10–5 sulphur-manganar-aluminium hydrate, have been found superior to ordinary sulphur dusts in the control of apple scab

[*Venturia inaequalis*: *R.A.M.*, ix, p. 734]. In three years' tests (two in severe scab seasons), sulphur-dry lime-sulphur produced 92·3 per cent. clean fruit in seven orchards, while the corresponding figure for sulphur-manganar-aluminium hydrate was 85·7; the plots dusted with a commercial sulphur dust yielded 71·6 per cent. clean fruit and the untreated controls 14·5 per cent.

BAUM-TCHOUMAKOVA (Mme E.). Горькая гниль Яблок, вызываемая **Glomerella cingulata.** [Bitter rot of Apples caused by *Glomerella cingulata.*]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 55–69, 1930. [English summary.]

This is a brief but comprehensive compilation of the work hitherto done on the apple bitter rot fungus (*Glomerella cingulata*) in America and Europe [*R.A.M.*, x, pp. 114, 253, et passim]. In Russia, where only the conidial stage (*Gloeosporium fructigenum*) is known to occur, the organism was first recorded on apples in 1904 from the Caucasus and the district of Kieff, but since then it has been found to be widespread on this and other hosts in practically all the fruit-growing regions; thus, in 1925 it was very prevalent in the Moscow district on the pedicels of the flower trusses, and on the fruit, of cherries, in some cases up to 30 to 40 per cent. of the crop being destroyed. The great majority of the apple varieties grown in Russia are stated to be more or less susceptible to bitter rot, but early varieties appear to exhibit a measure of resistance, probably owing to the fact that their rapid growth and early maturation allows them to escape infection, which attains its highest point in July. It was noted that some varieties apparently resistant in one locality are very susceptible in another. The greatest damage is, however, done in storage under conditions of high temperature and poor ventilation.

GARDNER (M. W.) & BAINES (R. C.). **Cultural characters and host range of the Apple sooty-blotch fungus.**—Abs. in *Phytopath.*, xxi, 1, p. 112, 1931.

Pure cultures of the sooty blotch fungus (*Gloeodes pomigena*) [*R.A.M.*, vii, p. 176; ix, p. 460] from apple fruits produce on potato agar a thick black thallus on and round which gelatinous masses of spores accumulate. The fungus grows well, though very slowly, on a variety of media, but has sporulated only on potato, malt-extract, and prune agars. Cultures similar to those on apple have been obtained from sooty blotch on the young wood of a number of other hosts, including *Smilax hispida*, papaw, *Vitis cordifolia*, white ash [*Fraxinus americana*], tulip tree [*Liriodendron tulipifera*], hard maple [*Acer saccharum*], willow [*Salix* sp.], hawthorn (*Crataegus*), blackberry, sassafras [*Sassafras officinale*], redbud [*Cercis canadensis*], bladdernut [*Staphylea* sp.], *Euonymus americana*, and *Cornus rugosa*, and from fly speck on several of these and other hosts. Sooty blotch has been produced on apples by inoculation with spore suspensions from cultures from apple, papaw, and *Crataegus*, and fly speck from *F. americana*. The incubation period in a cool, moist compartment in the greenhouse was about three weeks, but was much longer in the orchard.

YOUNG (H. C.) & WINTER (F.). **Brooks fruit spot.**—Abs. in *Phytopath.*, xxi, 1, p. 111, 1931.

Fruit spot of apples (*Mycosphaerella pomi*) [*R.A.M.*, x, p. 114] is reported to have caused heavy losses in the Ohio Valley during 1928, prior to which year the fungus had attracted little attention. The perfect stage of the organism has been found to occur on almost all types of deciduous leaves throughout the State. The ascospores mature earlier in northern than in southern Ohio. The optimum temperature for the growth of *M. pomi* was found to be 22° to 24° C.; development ceased almost entirely at 30°. Good control of the disease was obtained by the application of Bordeaux mixture (1–3–50).

BLISS (D. E.). **Physiologic specialization in Gymnosporangium.**—Abs. in *Phytopath.*, xxi, 1, p. 111, 1931.

Divergent statements have been received from various parts of the United States concerning the relative susceptibility of certain apple varieties to *Gymnosporangium juniperi-virginianae* and *G. globosum* [*R.A.M.*, ix, p. 392 and next abstract]. Collections of *G. juniperi-virginianae* from Iowa, Kansas, and Wisconsin caused only flecking on the Tolman and York Imperial varieties, while the same fungus from West Virginia produced aecidial cups on these hosts. Bechtel's double-flowering crab (*Pyrus ioensis*) was highly susceptible to all these collections.

Three collections of *G. globosum* from Iowa produced abundant aecidia on inoculation into *Crataegus mollis*, whereas flecking was the only symptom developing on the Fameuse, Tolman, Yellow Transparent, York Imperial, Wealthy, McIntosh, Baldwin, Delicious, and Northwestern Greening apple varieties. Although the aecidia of *G. globosum* were commonly found on *C.* spp. in Iowa, they were not observed on the leaves of 150 apple varieties examined in 1930. This fungus has, however, been identified on many varieties of apple in New York.

MILLER (P. R.). **Pathogenicity of three Red Cedar rusts that occur on Apple.**—Abs. in *Phytopath.*, xxi, 1, p. 111, 1931.

Successful inoculation was obtained with quince rust (*Gymnosporangium germinale*) [*R.A.M.*, vii, p. 176; viii, p. 582] on the fruit of Delicious, Winesap, Stayman, and Wealthy apple varieties and on quince foliage; with apple rust (*G. juniperi-virginianae*) [see preceding extract] on the fruit and foliage of Rome, Ben Davis, Grimes, and Wealthy apples, and on Jonathan leaves; and with hawthorn rust (*G. globosum*) [loc. cit.] on the foliage of Maiden Blush, Rome, Ben Davis, Jonathan, Grimes, and Wealthy apples, and also on pear and *Sorbus* sp. These results accord more or less with those observed in nature during 1929. Apple fruits were susceptible for about 15 days after petal fall. Indications of heterothallism were given on mixing the pycnidial exudates. Overwintering of aecidiospores resulted in a marked increase in the percentage of germination.

HUBER (G. A.). **The Aspergilli and their relation to decay in Apples.**—*Journ. Agric. Res.*, xli, 11, pp. 801–817, 17 figs., 1930.

The author states that his investigations showed that normal Jonathan apples harvested in 1927 in the apple-growing districts of Wenatchee, Washington, and kept in cold storage under the usual commercial conditions, carried on their surface up to 271,000 spores of various fungi per apple, while the maximum fungal population found in 1928 on similar apples which were enclosed in sterile wraps immediately on picking, was 159,000 spores. From among these fungi eleven forms of *Aspergillus* were isolated and studied in pure culture. These forms are briefly described and distributed in the following form groups: (1) *A. ochraceus*, series *sulphureus*; (2) *A. tamarii*; (3) white-spored *Aspergillus* group (not further identified); (4) *A. ustus*; (5) *A. niger*; (6) *A. sydowi*; (7) *A. terreus*; (8) *A. fumigatus*; (9) *A. glaucus*; (10) *A. nidulans*; and (11) resembling *A. sydowi* in colony characteristics but differing somewhat in other respects. Inoculation experiments showed that none of these forms is capable of causing decay in apples under cold storage conditions. Forms (2), (5), and (7) caused decay under ordinary storage conditions at temperatures of 10° to 12° C., and forms (1), (3), (9), and (10) at temperatures of 18° to 22°. The types of decay caused by the different forms varied greatly, and the surface and deep characters of the rots produced are described and illustrated by photographs.

GROVES (A. B.). **Natural fire-blight infections on Spiraea vanhouttei.**—*Phytopath.*, xx, 1, pp. 89–91, 2 figs., 1931.

The typical symptoms of fireblight were produced on pear and *Spiraea vanhouttei* shoots by inoculation with suspensions of *Bacillus amylovorus* isolated from natural infections on the latter host growing directly beneath a pear tree at the Virginia Agricultural Experiment Station [*R.A.M.*, viii, p. 386].

BERKELEY (G. H.). **Studies in fruit diseases. II. Diseases of Plums and their control.**—*Canada Dept. of Agric. Pamphlet* 119, N.S., 12 pp., 4 figs., 1930.

In this pamphlet (a revision of Circ. 15 by H. R. McLarty), the writer gives concise, popular notes on the symptoms of the following diseases of plums in Canada: black knot (*Dibotryon morbosum*) [*R.A.M.*, x, p. 83], brown rot (*Sclerotinia americana*), plum pockets (*Taphrina pruni*), shot hole or leaf spot (*Coccomyces prunophorae*) [ibid., viii, p. 120], and silver leaf (*Stereum purpureum*) [ibid., vi, p. 265], with directions for their control. A spray schedule and instructions regarding the use of some standard preparations are appended.

BERKELEY (G. H.). **Diseases of the Raspberry.**—*Canada Dept. of Agric. Pamphlet* 120, N.S., 23 pp., 12 figs., 1930.

In this paper (a revision of Pamphlet 72, N.S.) [*R.A.M.*, vi, p. 40], the writer summarizes recent information regarding the following diseases of raspberries in Canada: mosaic and leaf curl [ibid., v, p. 534; viii, p. 354; x, p. 195], rosette or bramble streak

[ibid., vi, p. 40], *Verticillium* wilt (*V. ovatum*) [ibid., viii, p. 301; ix, p. 6], spur blight (*Didymella applanata*, formerly referred to *Mycosphaerella rubina*) [ibid., vi, p. 739], crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*), and anthracnose (*Plectodiscella veneta*).

The Sunbeam, Herbert, King, Ohta, and Miller varieties are susceptible to mosaic in Saskatchewan, while in the Maritime Provinces the disease is severe on Herbert and Cuthbert. Leaf curl is prevalent (up to 30 per cent.) on Cuthbert in Quebec. The mottling is generally fine on Cuthbert, King, and Newman 23, whereas on Herbert, Marlboro, and Viking it is often very coarse. During the last five years the average annual increase of mosaic in Ontario was about 4 per cent. In an experimental plot of 30 mosaic and 30 healthy bushes, the total crop harvested from the former was only 18,664 berries as compared with 24,517 from the latter. The average increase of mosaic in seven plantations where certified stock was used in 1923, 1924, and 1925 was 0·5, 0·75, and 1·30 per cent., respectively, the corresponding figures for five plantations with ordinary stock being 4, 12·5, and 24 per cent. In order to be eligible for certification, raspberry nurseries must be in good general health, situated at least 320 ft. from other wild or cultivated raspberries, and contain not more than 2 per cent. mosaic and leaf curl at the first inspection, and not more than ½ of 1 per cent. at the second. Beginning in 1930, all certified raspberry stock is accompanied by an official tag designating the consignment as 'certified raspberry nursery stock'.

Rosette is extremely severe on black raspberries [*Rubus occidentalis*] in the Eastern and Middle Western United States.

Spur blight appears to be on the increase both in Quebec and Ontario, where the Herbert variety is particularly susceptible. Good control may be obtained by spraying with 3:6:40 Bordeaux mixture plus 2 lb. whale oil soap to every 40 galls. of solution. The first application should be given when the plants are 5 to 9 in. tall and the second (if necessary) a fortnight later.

The Columbian raspberry appears to be highly susceptible to crown gall, the presence of over ¼ of 1 per cent. in the crop at digging time being sufficient to disqualify the stock for certification.

Anthracnose is severe only on black raspberries and may be controlled by cultural measures, supplemented by a dormant application of 1 in 9 lime-sulphur and an additional treatment (in severe cases) of 3:6:40 Bordeaux plus 2 lb. whale oil soap.

WELLMAN (F. L.). **Progress in Fusarium wilt inside the rhizomes of Banana plants.**—Abs. in *Phytopath.*, xxi, 1, p. 121, 1931.

The water-conducting tissues of Gros Michel banana rhizomes attacked by *Fusarium cubense* [*R.A.M.*, x, p. 43] show a distinct, easily recognizable discoloration. A banana 'mat', or clump of connected plants arising from a single 'seed piece', becomes infected through uninjured roots or wounds in the rhizomes and the disease spreads from one plant to another in the clump by their underground connexions. In dissected rhizomes the course of the disease may be traced many months after infection. The

most rapid spread takes place inside the rhizome stele, generally occurring at first on one side, next to the endodermis. The fungus progresses towards the growing point of the rhizome and from plant to plant in the mat. The buds on the diseased side of the rhizome are stunted but the undifferentiated tissues are seldom involved. *F. cubense* was recovered in pure culture from the roots, rhizome, and leaf sheaths of infected plants, but not from the fruit stalk.

SIMMONDS (J. H.). **Brown spot of the Passion Vine.**—*Queensland Dept. of Agric. & Stock, Div. of Ent. & Plant Path., Bull.* 6, N.S., 15 pp., 7 pl., 1 graph, 1930.

The principal diseases of passion fruit (*Passiflora edulis*) in Queensland are a brown spot, due to a species of *Macrosporium* [cf. *R.A.M.*, v, p. 680], powdery spot and fruit scab, associated with a *Cladosporium*, a crown rot resembling that attributed to a *Fusarium* in New South Wales, and the virus disease 'woodiness' [ibid., viii, p. 185]. Of these, brown spot is by far the most destructive.

On the leaves the first symptom consists of minute brown dots which enlarge to circular spots 2 to 3 mm. in diameter; further growth may lead to a faint, concentric ridging and variegation of shades of brown, the older spots reaching 2 cm. in diameter.

On the fruits, a minute, dark green, water soaked spot appears, which enlarges into a more or less circular, usually depressed area of uniform brown, sometimes retaining the water soaked region as a narrow, dark green border. In the absence of secondary organisms the spot remains firm and the fruit shrivels.

Affected branches show a dark brown area extending for 2 to 4 cm. or more and generally associated with the leaf axils; eventually it may surround and girdle the shoot. A characteristic feature of the disease is the rapidity with which the abscission of affected leaves takes place, the leaf falling shortly after the appearance of even a single spot.

Extensive isolations consistently yielded a *Macrosporium*, inoculations with pure cultures of which gave typical lesions on the same parts. In general appearance the spores resemble those of *M.* [*Alternaria*] *solani*; septation is generally by 5 to 13 (usually 7 to 10) transverse divisions, and in many spores longitudinal and oblique septa are absent. In the naturally formed spore the beak is rarely forked, but in culture two or three branches are usually, and five sometimes, formed. Measurements of 80 spores from field material gave a length of 64 to 116 μ (average, 87 μ), the length plus beak being 108 to 240 μ (average, 168 μ), and the width from 15 to 26 μ (average, 20 μ). The corresponding figures for 20 spores from another district were 54 to 102 μ (average, 70 μ), 87 to 150 μ (average, 106 μ), and 16 to 27 μ (average, 21 μ), respectively.

In cultures on potato dextrose agar a fairly closely growing, light grey, cottony aerial growth, with black submerged hyphae develops. The colour of the media may change to various shades of brown or reddish-brown. Accompanying this discoloration there is often an orange or reddish-brown zonation of the mycelium, especially in old cultures. The optimum temperature for

growth was 25·5° to 28° C., maximum about 35°, and minimum near freezing point. Sufficient lesions are present throughout the year to ensure a continuity of spore material. After 19 months there was still 13 per cent. spore germination.

Between August and March severe epidemics may follow a short warm, wet period. Defoliation is most prevalent during December and January, the severity of the attack being largely determined by the amount of rainfall at the end of the year.

The commercial 'mammoth' variety of *P. edulis* appears to be as highly susceptible as the common purple variety.

The Brazilian white passion flower (*P. alba*), which grows wild in the coastal regions of Queensland, and also the granadilla (*P. quadrangularis*), were found to be similarly attacked, and inoculations of the fruits and stems of *P. edulis* with cultures from the other hosts invariably gave positive results. Inoculations of granadilla fruits with cultures from the same host and from *P. edulis* were also successful. A northern form of the granadilla organism showed considerable differences in cultural characters and spore measurements from the Brisbane granadilla strain, but when inoculated into *P. edulis* it produced definite brown spot lesions. It is considered that while the organisms obtained from *P. edulis*, *P. alba*, and the Brisbane-grown *P. quadrangularis* are closely allied strains of one species, the northern form is possibly distinct. *P. foetida*, growing some 250 miles north of Brisbane, showed brown spot lesions almost identical with those present on *P. edulis* and *P. alba* in the same locality and associated with a *Macrosporium* the cultural characters and spore measurements of which were somewhat different from the *P. edulis* organism, but inoculations with which produced typical lesions on the last-named host.

Prolonged experiments [details of which are given] showed that the main factor in control lies in systematic pruning at least once a year; this should be followed by an application of Bordeaux mixture 6–4–40 or 4–4–40 at intervals of one month up to the end of January, after which date the applications should be made at intervals of six weeks or two months until the next pruning time. When the fruit is mature, ammoniacal copper carbonate may be substituted for the Bordeaux mixture.

[This paper also appears in the *Queensland Agric. Journ.*, xxxiv, 6, pp. 564–585, 7 pl., 1 graph, 1930.]

WILCOXON (F.). **Hydrogen sulphide as related to the fungicidal action of sulphur.**—Abs. in *Phytopath.*, xxi, 1, p. 132, 1931.

Hydrogen sulphide, evolved when sulphur is applied to the surface of spores and leaves of higher plants, has been found extremely toxic to the former [cf. *R.A.M.*, ix, p. 733]. The germination of uredospores of *Uromyces caryophyllinus* and *Puccinia antirrhini*, and of conidia of *Venturia inaequalis, Sclerotinia americana, Macrosporium sarcinaeforme, Pestalozzia stellata, Glomerella cingulata*, and *Botrytis cinerea* was inhibited at hydrogen sulphide concentrations ranging from 0·2 to 40 mg. per l. of solution. The production of hydrogen sulphide by spores appears to depend on the quantity of the latter; it increases with rising

temperature to about 30° C., ceasing at 65°, and occurs over a P_H range from 4 to 8, with no well-defined optimum. Conidia of *S. americana* and *G. cingulata* produce, respectively, 5 and 15 per cent. of their weight of hydrogen sulphide in six hours. The reduction of sulphur on or in the spores and its initiation by glutathione (demonstrated in *S. americana*) is indicated [loc. cit.].

TETEREVNIKOVA-BABAYAN (Mme D. N.). К вопросу об образовании ожогов от фунгицидов. [The problem of the causation of scorch injury by fungicides.]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 97–122, 14 graphs, 1930. [German summary.]

These investigations, carried out at the Leningrad Agricultural Institute, deal with the factors involved in the production of leaf scorch by fungicidal sprays. The most important of these were found to be the chemical constitution (e.g., the nature of the ions of the electrolytes), and the solubility of the spray substances, about 30 of which were tested; the latter property was in direct ratio to the amount of injury caused to the leaves. The toxicity to the leaf of the cations of the alkaline and alkaline-earth metals tested was determined to be in a well-defined descending order from the former to the latter, e.g., potassium, sodium, calcium, barium, etc. Hydrogen-ion concentration, on the other hand, appears to be of minor importance, the leaf being apparently but little sensitive to the action of this factor. As an index of toxicity, the lowest concentration which causes scorch was taken.

Next in importance is the constitution of the leaf surface, which determines the macroscopical characters and extent of the scorch lesions. The scorching effect was found to increase with the wettability and permeability of the leaf cuticle and the number of stomata, this explaining why the under surface is more sensitive to scorch than the upper. Susceptibility to scorch decreases as the leaves increase in age. Wounding young leaves before spraying did not render them more liable to scorch, but in older leaves wounds aggravated the scorching effect of the sprays.

Preliminary work on the influence of meteorological factors indicated that they are of secondary importance, but with acid solutions air temperature and humidity at and immediately after spraying appear to play a considerable part in the severity of the scorch. Direct insolation of the sprayed leaves can cause scorch independently of the toxicity of the substance to the leaf, probably owing to the fact that the droplets of liquid on the surface act as small condensing lenses.

CLAYTON (E. E.). **Effect of seed treatments on seed longevity.**—Abs. in *Phytopath.*, xxi, 1, pp. 105–106, 1931.

The results of six years' experiments on the fungicidal treatment of various vegetable seeds indicate that the general fear of injury to the seed from this method of disinfection is well founded. The life of the seed was found to be greatly curtailed by such standard treatments as immersion in mercuric chloride, liquid organic mercurials, or hot water, even in the absence of apparent injury. The dust treatments usually had no injurious after-effects, and

experiments have shown that much can be done to reduce or eliminate the adverse consequences of seed treatment.

VLADIMIRSKAYA (Mme N. N.). К вопросу дезинфекции почвы. [On the question of soil disinfection.]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 22–54, 1930. [English summary.]

This is a detailed description and discussion of experiments conducted in 1928-9 at Peterhoff [near Leningrad], to investigate the action of various methods of soil disinfection on the physical and chemical constitution of the soil, its bacterial and fungal population, and on the germination of seeds and growth of plants in it. With the exception of formalin (which at first entirely suppressed but later considerably stimulated the development of nitrogen-fixing organisms in the soil) all the chemicals tested (e.g., paradichlorbenzene, chloride of lime, sulphur dioxide, mercuric chloride, copper carbonate, and the like) had a more or less prolonged detrimental effect on the nitrifying processes in the soil, and also adversely affected, when applied in high concentrations, the growth of plants and retarded the germination of the seeds. When applied to plots known to be heavily infected with *Plasmodiophora brassicae* and *Colletotrichum lini*, these substances gave only partial control, with the possible exception of mercuric chloride, which proved to be fairly effective against the cabbage finger-and-toe organism. Not infrequently the chemical disinfection of the soil even tended to preserve the fungal spores in a viable condition from one season to the next.

Heating the soil at relatively low temperatures and for comparatively short periods of time, on the other hand, gave very promising results. Thus, an exposure of the soil to 60° C. for 30 minutes killed all the spores of *P. brassicae*, and 50° for the same length of time was sufficient to destroy all the *C. lini* spores. This method has also the advantage of definitely increasing the fertility of the soil and in no way interferes with its physical or chemical properties. Plants growing in soil thus treated do not show any symptoms of depression.

JACZEWSKI (A. A.). Справочник фитопатологических наблюдений. [A guide to phytopathological observations.].—237 pp., A. A. Jaczewski Mycological Laboratory, Leningrad, 1930.

In the first part of this book the author gives a brief review of the general aims and of the recent attainments of phytopathology both in Russia and abroad. Particular stress is laid on the methods for the evaluation of the economic losses caused by various diseases of cultivated plants, and recommendations are made for the use of practical workers in recording the diseases and the damage done by them. This is followed by a comprehensive list of the more dangerous virus, bacterial, and fungal diseases of 136 cultivated plants and trees, arranged in the alphabetical order of the Latin names of the hosts (with a brief indication of the lesions caused by them). Dioecious rust fungi are listed separately in the order of the hosts of their aecidial and of their uredo- and teleutospore stages. A valuable bibliography is appended.

KARAKULIN (B. P.). Об опытах по изучению вредоносности болезней растений путем применения искусственных заражений. [Note on experiments in the study, by means of artificial infection, of the extent of injury done by plant diseases.]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 1–8, 1930. [German summary.]

The experiments briefly described in this paper were made in 1929 at the Chief Botanic Garden in Leningrad for the purpose of investigating the possibility of determining, by means of artificial infection under controlled conditions, the extent of the injury done to plants by fungal and bacterial diseases. Owing to the climatic conditions of that year, a degree of success was only obtained in artificial infection of a pure line of *lutescens* wheat with brown rust [*Puccinia triticina*]. The results appear to indicate that the rust does not exert any effect on the development of the vegetative organs of the host, as judged by the air-dry weight of individual plants, but adversely affects the total weight of the grain in the ear, and also the absolute weight of each individual grain.

The author discusses at some length the difficulties encountered in this kind of work, and makes some suggestions as to the best way of surmounting them.

COOK (M. T.). **New virus diseases in Porto Rico.**—Abs. in *Phytopath.*, xxi, 1, p. 124, 1931.

The following diseases occurring in Porto Rico have not hitherto been reported. A mosaic of *Crotalaria striata* dwarfs the plant and reduces seed production, but is not seed-borne. A rare mosaic of *Commelina longicaulis* appears only on vigorously growing plants which are not injured. A bunchy top of *Carica papaya*, apparently due to a virus, is very destructive but easily eradicated. A common variegation of *Abutilon hirtum* causes some dwarfing and reduces seed production, but is not seed-borne. A variegation of several species of *Sida* may be due to the same virus [cf. *R.A.M.*, vii, p. 386]. The leaves of several species of mulberry are subject to a mottling, apparently caused by a virus, which is transmissible by scions.

SAXTON (W. T.). **The root nodules of the Podocarpaceae.**—*South African Journ. of Sci.*, xxvii, pp. 323–325, 1 fig., 1930.

An anatomical examination of the root nodules of a Tasmanian species of *Pherosphaera* [*P. hookeriana*], the Tasmanian *Podocarpus alpina*, and *P. thunbergii* from Table Mountain revealed no trace of bacteria, though mycorrhizal fungi were present in the *Pherosphaera* and the South African *Podocarpus*. The *P. alpina* nodules were also apparently mycorrhizal in origin. Cultures from fresh material of *P. thunbergii* also showed no evidence of the presence of bacteria or of *Rhizobium* [*Bacillus*] *radicicola* [*R.A.M.*, iii, p. 225; see also ibid., ix, p. 601], and the author accordingly considers that the root nodules are mycorrhiza.

It is suggested, as no leguminous plants grow within a considerable distance of the habitats of the Tasmanian *Pherosphaera* and the South African *Podocarpus*, while this was not so with McLuckie's material [loc. cit.], that in habitats where Leguminosae

are present and where *B. radicicola* is abundant in the soil, this organism may readily obtain a footing immediately following the invasion of mycorrhizal fungi, and may even supplant the latter in the soft central tissues of the nodule.

KÖHLER (E.). **Die Immunitätsfrage im Lichte neuer Forschung.** [The immunity problem in the light of new research.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlv, 32, pp. 687–689; 33, pp. 709–711, 1930.

Four groups of factors are stated to be involved in the reaction of any given host to a particular fungous or bacterial parasite, viz., (1) the various specific stimuli emanating from the plant which attract the parasite; (2) the innumerable factors producing either a favourable or an adverse effect on the development of the fungus; (3) the specific susceptibility of the host to the injurious action of the parasite; and (4) those factors that are not originally active in the plant but have been stimulated by the fungus itself to a favourable or adverse action on the latter [*R.A.M.*, ix, p. 47]. Examples are given of the action of these factor groups.

Reference is made to the work of various recent investigators on breeding for resistance to plant diseases, with notes, *inter alia*, on the researches of K. O. Müller in Germany on potato selection against late blight (*Phytophthora infestans*), and on those conducted at the Winnipeg Rust Research Laboratory in connexion with the development of wheat varieties resistant to rust (*Puccinia*) [*graminis*: ibid., x, pp. 169, 170].

KOSTOFF (D.). **Changes in the proteins and induction of tumour formation by certain agents. (A contribution to the aetiology of tumours.)**—*Yearbook Univ. of Sofia, Fac. of Agric.*, ix, pp. 269–300, 5 pl., 1931. [Bulgarian, with English translation.]

In continuation of his researches on the etiology of proliferating tumours in plants [*R.A.M.*, x, p. 200], the author states that experiments with chemical substances which induce the formation of such tumours (e.g., ether [ibid., ix, p. 91], lactic acid, formic acid, etc.) showed that these substances also cause precipitation, lysis, and agglutination of the proteins contained in the cytoplasm of the hosts. Filtrates of tar and aniline (two substances known to produce experimental cancer in animals) heated in the presence of water were also shown to precipitate very strongly the blood serum of mice, and the tar filtrate slightly agglutinated the red blood corpuscles.

MCRAE (W.). **Note on 'wilt' in Rahar in permanent plots at Pusa.**—*Proc. Board Agric. India, 1929*, Appendix iii, pp. 236–241, 1931.

Details are given, as a result of a survey of the first 20 years of the permanent manurial plots at Pusa, regarding the influence of fertilizers on the incidence of pigeon pea (*Cajanus indicus*) wilt [*Fusarium vasinfectum*: *R.A.M.*, ix, p. 430]. The land is double-cropped, in accordance with local custom, and the two years' rotation consists of maize, pigeon pea, maize, and oats. The effect on

the disease of the different treatments did not become sufficiently pronounced to attract attention until 1917, when the experiments had been in progress nine years. In subsequent years counts were made of the number of wilted plants in the different plots (each of $\frac{1}{4}$ acre), and from the season 1922–3 until 1927–8 the average results were as follows: In five plots receiving no phosphatic manure and representing plots with no manure and with nitrogen, potash, and green manures, respectively, the average number of wilted plants each year was 241 and 231 for the duplicate series. In three plots receiving superphosphate either alone or in combination with potassium sulphate or with this plus ammonium sulphate the average number of wilted plants in the duplicate series was 1,122 and 977, respectively. In a plot receiving green manure alone the average annual incidence in the duplicate plots was 51 and 120 (this latter plot had been subject to flooding), and where green manure and superphosphate were combined the figures were 354 and 605. The average annual percentage of the plants that wilted in the above four groups were, in the duplicate plots 8 and 6, 39 and 22, 1·5 and 4·5, and 14 and 28, respectively. The data on which these figures are based are set out in tabular form, and in the short summary of the results the opinion is expressed that in a general way the amount of wilt seems to be correlated with the presence of phosphate. In the survey of the results of the manurial treatment made by the Imperial Agricultural Chemist it is stated that phosphoric acid is the only constituent of the fertilizers used that gives a distinctly positive reaction in the crops tested under the conditions of the soil in question when applied alone, but that a complete manure gives the best results.

QUANJER (H. M.). **Die Selektion der Kartoffel und der Einfluss äusserer Umstände, insbesondere der Düngung, auf das Selektionsergebnis.** [Potato selection and the influence of external conditions, especially of manuring, on the outcome of selection.]—*Ernährung der Pflanze*, xxvii, 1, pp. 1–8, 1 pl., 4 diags., 1931.

The writer here summarizes the results of recent investigations by himself and his collaborators on the relation between the manuring scheme and the incidence of different virus diseases of potatoes in Holland (especially pseudo-net necrosis) [*R.A.M.*, ix, p. 483]. The conclusion is reached that, while climatic influences are probably paramount in determining the results of selection against the virus diseases, the occurrence of the latter may be restricted by moderation in the nitrogen supply and copious applications of potash.

ROUZINOFF (P. G.). Некоторые данные по физиологии скручивания листьев Картофеля. [Some data on the physiology of Potato leaf roll.]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 148–159, 1930. [German summary.]

The results of the experiments described in this paper (in which organic stains, e.g., methylene blue, gentian violet, etc., were used as indicators) showed that the juice extracted from the leaves,

stems, tubers, and roots of potato plants affected with leaf roll contains a well marked excess of oxidizing ferments (oxidases and peroxidases) [but see *R.A.M.*, x, p. 333], over the amount of these substances present in the juice of normal plants. The determination by the colorimetric method of the hydrogen-ion concentration inside the stems and tubers indicated that the tissue juices are more acid in leaf roll than in normal plants. Although the experiments made with potato seeds were too few for definite conclusions, the seeds from leaf roll plants did not show any more oxidizing ferments than healthy seeds.

This work was done in the attempt to find a rapid laboratory method for determining the presence of virus diseases in potato plants suspected of harbouring them but showing no apparent symptoms. In discussing the above results, it is pointed out that the reaction with methylene blue is greatly hampered by the presence in the juice extracts of particles of extraneous substances, the separation of which by filtering is very complicated and little adapted for general practice in diagnostic work.

BURNETT (G.) & JONES (L. K.). **The distribution of the latent virus in tubers of commercial Potatoes.**—Abs. in *Phytopath.*, xxi, 1, p. 104, 1931.

Tomato plants were inoculated with the macerated leaf tissue of apparently healthy plants grown from 93 tubers of commercial potato varieties (Netted Gem, Early Rose, White Rose, Wisconsin Pride, Burbank, and Beauty of Hebron), combined with macerated leaf tissue of tobacco plants affected by common tobacco mosaic. One tuber of the Early Rose variety was found to be free from the latent virus ['healthy potato virus': see below, p. 409]. During the growing season in the field the foliage of four plants produced from this tuber remained free from the latent virus, while the foliage of another plant from this tuber, after inoculation with the macerated tissue of a potato affected by rugose mosaic, produced streak in tomato when leaf tissue from it was inoculated in combination with tobacco mosaic.

RICHARDS (B. L.). **Further studies with psyllid yellows of the Potato.**—Abs. in *Phytopath.*, xxi, 1, p. 103, 1931.

In repeated tests the adult form of *Paratrioza cockerelli*, in numbers up to 1,000 per plant, has failed to produce the symptoms of psyllid yellows on the potato [*R.A.M.*, x, p. 65], whereas nymphs do so uniformly. All attempts to free the nymphs from the infective principle by growing young nymphs on healthy plants from eggs hatched on healthy leaves in Petri dishes have so far failed. The type of symptoms and the degree of injury to the plant appear to be definitely correlated with the number of nymphs feeding, the length of the feeding period, and the intensity and duration of light exposure. In the greenhouse psyllid yellows cannot be uniformly induced with fewer than 15 nymphs; with larger numbers the symptoms appear in 4 to 6 days. The removal of the feeding nymphs from the plant 5 to 10 days after the appearance of the first symptoms interrupts the disease, and the plants assume a normal aspect. In Utah normal plants developed from the tubers of psyllid-infested plants.

WELLENSIEK (S. J.). **De vatbaarheid voor slijmziekte van 32 geimporteerde Aardappelrassen.** [The susceptibility to slime disease of 32 imported Potato varieties.]—*Korte Meded. Inst. voor Plantenziekten*, 16, 5 pp., 4 graphs, 1931. [English summary.]

The susceptibility of 32 potato varieties, imported from Holland, to slime disease (*Bacterium solanacearum*) in Java [ibid., viii, p. 225] was tested by means of artificial inoculation and by exposure to natural infection (through planting in heavily infected plots), of which only the latter method was successful. All the varieties (including Alpha, Bevelander, Bravo, Eersteling [Early Midlothian], Eigenheimer, Industrie, Irish Cobbler, Kerr's Pink, Magdeburger Blaue, Parnassia, Paul Kruger [President], Roode Star, and Triumph) proved susceptible to the disease, but a certain degree of resistance was shown by Botergele and Dauer Rages, which contracted infection at a later stage of development than the others.

EICHINGER. **Potato scab and manuring.**—*Superphosphat*, vii, pp. 8-16, 1931. [Abs. in *Journ. Soc. Chem. Ind.*, l, 14, p. 312, 1931.]

The effects of nine years' continuous application of various fertilizers on the development of scab [*Actinomyces scabies*] in potatoes in Germany are recorded. The incidence of infection was found to be reduced by superphosphate, ammonium sulphate, potassium magnesium sulphate, and probably potassium sulphate [cf. *R.A.M.*, ix, p. 801]. The spread of the disease is favoured by chalk and basic slag, and possibly by potassium chloride. The heaviest scab infections followed the use of sodium nitrate, the effect of calcium cyanamide being similar but less marked.

GOMOLYAKO (N. I.). Наблюдения над развитием порошистой парши у Картофеля. [Observations on the development of powdery scab of Potatoes.]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 79–88, 1930. [German summary.]

An account is given of an epidemic outbreak of potato powdery scab (*Spongospora subterranea*) in 1929 at the White Russian Central Potato Station near Minsk, which was the less expected as hitherto the disease was practically unknown in Russia, and isolated records of its occurrence to a very slight degree had only begun to appear within the last year or two. The fact that in the spring of 1929 nine out of the 64 potato varieties grown in 1928 at the station and selected for testing for resistance to other diseases exhibited slight infection with *S. subterranea* indicates, however, that the organism was already present in the soil of the Station in 1928, a suggestion supported by the observation that the disease also attacked the first crop raised there from potato seedlings. A fairly heavy infection with powdery scab was also found in 1929 in potato samples received from neighbouring localities in the government of Minsk.

In giving a summarized account of the disease, compiled from foreign sources, it is stated that all the evidence tends to show that it has been more or less recently introduced from abroad into the

district, where it has apparently found congenial conditions for its development, and has now created a serious infection focus, demanding special methods to prevent its further spread. Although there was some indication of variations in susceptibility among the potato varieties grown at the Station, the results of only one year's observation are deemed insufficient for any definite conclusion in this respect; the group which was least affected included Svitez, Deodara, Pirola, Rubia, Parnassia, Gavronek, and Jubel. No relationship was observed between resistance to *S. subterranea* and resistance to common scab [*Actinomyces scabies*]. Manuring appeared to stimulate the development of the disease, but only by promoting the growth of an abundant and dense foliage which protected the soil from insolation and evaporation, and thus created conditions favourable to the organism.

KŘÍŽ (K.). **Laboratorní zkoušky Bramborových odrůd na vzdornost vůči rakovině.** [Laboratory tests of Potato varieties for resistance to wart disease.]—*Ochrana Rostlin*, 6, pp. 165–169, 1930.

In pointing out the advantages of laboratory over field experiments for testing potato varieties for resistance to wart disease (*Synchytrium endobioticum*), the author briefly describes the laboratory methods which were elaborated by Miss Curtis, Miss Glynne, and Bryan in England, and by Spieckermann and Kotthoff, and Lemmerzahl in Germany [*R.A.M.*, ix, p. 802].

POOLE (R. F.). **A chemical control of Sweet Potato scurf.**—*North Carolina Agric. Exper. Stat. Tech. Bull.* 38, 52 pp., 1 pl., 18 figs., 1930.

A full account is given of four years' investigations conducted in North Carolina on the control of scurf of sweet potatoes (*Monilochaetes infuscans*) [*R.A.M.*, vi, p. 507; vii, p. 343; x, p. 268], which causes an average annual loss in North America of 7 to 15 per cent., the losses on individual crops sometimes exceeding 35 per cent. The principal effect of scurf is a reduced market value owing to the brown discoloration produced (but partly removable with ammonia water) in the periderm tissues, with desiccation and shrinkage.

Tests showed that the fungus does not spread from plant to plant when set as close as 6 in. apart, though once a plant is infected the mycelium spreads in all directions to the underground parts. Seed certification is of little value in preventing dissemination, as the trace of infection usually allowed often results in complete infection when diseased and healthy plants are dipped in the same water to remedy temporary wilting, and also serves to inoculate the soil.

When diseased seed potatoes were treated with numerous [named] chemicals the best control was given by 15 minutes' immersion in a 1 in 1,000 solution of mercuric chloride or by dipping in a 10 per cent. hydroxymercurichlorophenol solution diluted to 1 in 10 strength; hot chemicals and presoaking only slightly increased the value of the treatments.

In pure culture, the growth of *M. infuscans* was inhibited at

P_H 3 and was very weak between P_H 3·5 and 4·5, the optimum lying between P_H 5·5 and 7. Attempts to control the disease by sulphur applications at the rates of 300 and 600 lb. per acre (which increased the soil acidity from P_H 5·8 to P_H 4·3 and 3·3, respectively), resulted in clean potatoes even when diseased plants were set. On light sandy soils the plants and yield were not adversely affected, but on loamy soils severe injury from the sulphur ensued. As a rule, the sulphur treatment left the soil too acid for other crops, and it is recommended only for the best sweet potato lands.

Pure sulphur applied to turgid stems and roots with dry or slightly moistened surfaces immediately before transplanting created such an acid reaction on the affected parts that the fungus was arrested and killed before it could reach the potatoes. The infected tissues sloughed off during the growing period, resulting in healthy stems and potatoes at harvest. The amount of sulphur adhering to wet roots caused some stem injury on loamy soils.

When stem rot (*Fusarium batatatis*) [ibid., x, p. 269] is severe, 10 per cent. hydroxymercurichlorophenol or hydroxymercuricresol in 90 per cent. inert material added to water to make a 1 in 10 strength should be used to dip the roots and stems immediately before planting. These substances, though less effective than sulphur against *M. infuscans*, gave entirely practical control while they are more effective than the latter against *F. batatatis*.

The development of clean seed stock from vine cuttings offers a practical and certain control provided that the soil used for growing the seed stock is not infected.

CIFERRI (R.) & BRUNER (S. C.). **Cercospora bataticola, n.sp., parasite of the Sweet Potato in America.**—*Phytopath.*, xxi, 1, pp. 93–96, 1 fig., 1931.

A biometrical study [the results of which are tabulated] of the conidial measurements of *Cercospora batatae* from sweet potato from the Philippines and species of *Cercospora* on the same host in Florida, Cuba (where the investigation was conducted), and the Dominican Republic, respectively, indicated that the American forms differ from the Asiatic in their longer and broader conidia with a larger number of septa. The purplish-black spots produced by the American strains are smaller than those associated with the Philippine species (3 to 8, rarely 10 mm. in diameter, compared with 10 to 15 mm.). In view of these differences and in accordance with the opinion of Harter and Weimer [*R.A.M.*, viii, p. 665], the writers propose to separate the American and West Indian *Cercospora* on sweet potato from the Old World form under the name *C. bataticola* n.sp.

ZBORAY (E. v.). **Roode wortelschimmel bij jonge Heveaboomen, in verband met rejuvenatie of herontginning von oude aanplantingen.** [Red root fungus on young *Hevea* trees in relation to rejuvenation or reclamation of old plantations.]—*De Bergcultures*, v, 2, pp. 34–37, 1 diag., 1931.

One of the serious problems with which planters in Java have to deal is the control of the red root disease of *Hevea* rubber

caused by *Ganoderma pseudoferreum* [*R.A.M.*, ix, p. 806]. In practice it is almost impossible completely to free the soil in forest clearings destined for rubber plantations from every trace of wood. In Bantam the cost of removing the wood for a depth of 1 m. is Fl. 400 per bouw [0·71 hect.], and then there is no absolute certainty that none remains.

In the gardens at Madjau newly planted in 1926 the fungus was first observed at the end of 1929, and in October, 1930, when a number of trees collapsed in a storm, the tap-roots and practically all the lateral ones were found to be attacked. The source of infection in this case was the roots of trees left behind in the tertiary forest soil. At the end of 1925 a nursery was established at the edge of a rubber plantation dating from 1913–4; the nearest large *Hevea* tree, at a distance of 3 m., had already been eradicated in the previous June on account of red root disease and the site surrounded by a ring trench 4 m. in diameter and 60 cm. in depth. In June, 1930, some of the young trees died, and two months later the roots of a number of them that had collapsed in a storm were found to be infected by *G. pseudoferreum*. The subsequent examination of 87 young trees in the vicinity showed that 23 were dead, 20 severely infected, 9 slightly attacked, and 35 still healthy. It is evident from these data that the isolation trench was inadequate to prevent the infection of the adjacent seedlings; two roots of another 17-year-old tree near the latter were also invaded.

The necessity of removing from forest clearings all woody débris likely to harbour the red root fungus is apparent from these investigations.

Jensen (H. L.). **Notes on a cellulose-decomposing soil fungus of an unusual character.**—*Proc. Linn. Soc. New South Wales*, lv, 5, pp. 699–707, 1 pl., 1930.

A morphological and cultural account is given of a cellulose-decomposing fungus, probably belonging to the genus *Botryosporium*, which was isolated from a neutral clay soil mixed with well-rotted manure from a field in England. In two- to three-days-old cultures on cellulose-agar [the composition of which is given] the vegetative mycelium consists of hyaline, septate hyphae, from 2·5 to 8 or 9 μ in diameter; clamp-connexions were not seen, but anastomoses, giving rise to H-shaped figures, were frequent. After four or five days small, dark, first greyish, later jet-black granules begin to form along the edge of the plate, their formation then proceeding centripetally. These granules are formed of clusters of chlamydospore-like, globular to barrel-shaped cells, 30 to 35 by 13 to 16 μ, with coarsely granular contents and thick, rough, dark walls. The aerial growth consists of richly branched, hyaline or pale brown conidiophores, 2·8 to 3·3 μ wide, the terminal branches of which bear numerous lateral, roughly globular conidial heads, 8 to 11 μ in diameter; the conidia are almost spherical to ovoid or slightly triangular, hyaline, with homogeneous contents, and 2·1 to 2·8 μ (sometimes only 1·8 μ) in diameter.

The fungus was found to be very sensitive to acidity, P_H 4·5 being very near the limit for its growth, the optimum for which appeared to range between P_H 6·6 to 7·4 or possibly higher. In

neutral or alkaline solutions the fungus decomposed cellulose very actively, but very little, if at all, in unbuffered physiologically acid solutions. The optimum temperature for growth seems to be from 35° to 40° C. At 18° to 20° growth is still active, although much retarded, and at 54° no growth occurs.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1930.**—*Journ. Inst. of Brewing*, N.S., xxviii, 1, pp. 24–31, 1 pl., 1931.

In 1930, downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, x, p. 127] probably caused even greater damage in Kentish and Hampshire hop gardens than it did in the wet season of 1927. A very considerable acreage in both counties had to be left unpicked, the cones being completely brown. Where home-made Bordeaux mixture was used its remarkable efficiency in controlling *P. humuli* was again abundantly evident, even when it was applied late and on severely affected bines. In one garden where the hops were heavily mildewed, the grower sprayed while they were mostly in full burr, and again as soon as the burr had disappeared, with the result that a full crop of clean, well developed hops was obtained. That hops in burr can be safely sprayed once with Bordeaux mixture was confirmed by other experiments, while in a test at East Malling [loc. cit.] Y 90 hops were sprayed five times while in burr, without resultant injury to the cones.

For general control of the disease the authors recommend three applications: (1) when the bines reach the top of their supports, (2) immediately before the burr appears, and (3) immediately after the burr has gone; the second and third applications may be made even if some burr is present. At each application from 100 to 300 gallons of spray fluid should be used per acre.

A remarkable feature of the year was the unexpected susceptibility shown by the usually resistant Fuggles hops [cf. ibid., viii, p. 61] in certain localities where the cones in some gardens were so severely infected that the crop became unfit to pick. While it is possible that the Fuggles variety may be composed of different strains, and only those gardens containing susceptible ones are attacked, it is much more probable that the fungus is developing a new form capable of overcoming the resistance of the Fuggles cones, and that this form is now appearing in or spreading to different districts.

MILOVTZOVA (Mme M. A.). Образ жизни и история развития **Taphridium umbelliferarum Lagerh. et Juel.** (Предварительное сообщение). [Life-history and development of *Taphridium umbelliferarum* Lagerh. et Juel. (Preliminary communication).]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 15–22, 9 figs., 1930. [English summary.]

Taphridium umbelliferarum [*R.A.M.*, ii, p. 243] is stated to have been first recorded on caraway (*Carum carvi*) in Detskoye Selo [near Leningrad] in 1920, since when it has been found every year in abundance on this host over the whole of the Leningrad district. The fungus is a leaf parasite, the first symptoms appearing early in the spring immediately after the emergence of the

first leaves from the buds; the affected leaves are conspicuous by their duller colour, thicker consistency, reduced segmentation, curliness, and smaller size than normal; they soon turn reddish-brown and die. Later in the season the plants appear to throw off the disease and continue to develop normally, but not until from five to ten leaves have been destroyed, thus causing considerable damage to the crop.

The investigation of the life-history of the fungus indicated that it overwinters in the dead leaves, from which it infects the new foliage the next spring. It enters the host through the stomata and forms intercellularly between the palisade tissue and the epidermis of the leaf a compact hymenial layer, similar to that in *Taphrina*. The hymenial layer consists of broad, flat cells which later give rise to rounded or ellipsoidal sporangia measuring 45 to 75 by 30 to 60 μ. On maturity the sporangium liberates from its apex ellipsoidal or oval, budding spores, 2 to 9·1 by 1 to 4·8 μ in diameter. In pure culture the fungus developed best on malt extract gelatine or agar, and in rain water, or a weak solution of dextrin. Its temperature relations were: minimum for growth 7° to 10° C., optimum 20° to 25°, and maximum 27° to 30° the spores were killed at 40° to 45°.

PRIODE (C. N.). **Target blotch of Sugar Cane.**—*Phytopath.*, xxi, 1, pp. 41–57, 1 col. pl., 7 figs., 1931.

This is an expanded account of the writer's investigations on the target blotch of sugar-cane in Cuba, caused by a species of *Helminthosporium*, a preliminary note on which has already appeared [*R.A.M.*, viii, p. 466].

A detailed description is given of the cultural characters of the fungus on various media. The conidia are very similar on the different media though they may vary from light to dark brown. The shape is slightly and inequilaterally curved and the average size 76·2 by 15·4 μ. Germination is typically from the end cells. Conidial production was stimulated by the absence of light, which had the opposite effect, however, on mycelial development.

In December, 1928, several plants of the C. 760 variety were inoculated with conidia from monospore cultures. About 24 hours after inoculation numerous small red specks appeared on the unrolled leaves and spindle rolls. Mottled red rings developed round the spots, later becoming necrotic and turning straw-coloured; the concentric or zonate rings continued to form until the leaves became separated from the leaf roll. Further tests showed that the concentric rings were formed only when infection occurred on the leaf roll, the fungus being evidently incapable of spreading in the open leaves. A mass of mycelium is usually discernible between the layers of leaves in the infected rolls, the spread of infection and ring formation in which seems to be due to the spread of hyphae between the leaf surfaces rather than to the advance of the fungus within the tissues.

Of the cane varieties tested, the newly introduced P.O.J. varieties 2883, 2878, 2727, 2725, 2722, 2714, and 36, as well as Co. 281, 213, and H. 109 are highly resistant to the disease.

KONINGSBERGER (V. J.) & VAN DEN HONERT (T. H.). **Over de oorzaak der z. g. 'kalimati-ziekte'. (Voorloopige mededeeling.)** [On the cause of the so-called 'kalimati' disease. (Preliminary note).]—*Arch. voor Suikerind.*, Deel I, xxxix, 2, pp. 28–39, 1931.

The results [which are fully discussed] of preliminary investigations on the etiology of the so-called 'kalimati' disease of sugar-cane in Java indicate that ferrous oxide poisoning is the basis of the trouble. The remedial effects of potash (to the absence of which the disease was tentatively attributed by Miss Wilbrink) are thought to be due to an antagonistic action between the potash and the iron. The symptoms of 'kalimati', as described by Miss Wilbrink (*Versl. Vereen. Chem.-, Tech.- en Landbouwkundig Adviseurs*, p. 325, 1929), include stunting of young canes and a chlorotic appearance (pale green, bronze-green, or bronze-yellow) of older leaves, the tissues of which show small, elongated, dark red spots. Affected canes often die prematurely.

VERWOERD (L.) & DIPPENAAR (B. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa.**—*South African Journ. of Sci.*, xxvii, pp. 326–330, 1930.

In this paper diagnoses are given in English of some new species of South African fungi and of fungi hitherto unrecorded from South Africa. The following are of economic interest.

Cladosporium baccae n. sp., which causes a rot of ripe grape berries, is at first punctiform and covered by the epidermis, then erumpent and developing a raised, olivaceous, circular, velvety spot in the infected area. The recumbent, flexuous, rarely branched, olive-coloured, irregularly septate conidiophores, which are not nodular, measure up to 128 by 6·5 μ and are slightly swollen at the base. The spherical, subspherical, ovate, clavate, cylindrical, or elongated, 1- to 2-septate, terminal conidia measure 12 to 25·6 by 4·8 to 6·5 μ, and are smooth, light brown, with darker walls, and round or slightly pointed ends.

Diplodia monsterae sometimes destroys large areas of the leaves of *Monstera deliciosa.* The epiphyllous, scattered, immersed, then erumpent, separate, unilocular, globose pycnidia measure up to 140 μ in diameter; and the elongated, brown, 1-septate conidia are not constricted at the septum and are 20·8 by 11·2 to 12·8 μ in diameter. The exospore is thin, smooth, and not surrounded by a gelatinous sheath.

Mycosphaerella pinodes (Berk. and Blox.) Stone is found on the leaves, stems, and especially the tendrils of peas [*R.A.M.*, x, p. 284]. The hypophyllous, numerous, scattered, punctiform, partially erumpent, globose or subglobose, black perithecia measure 80 to 104 μ and are provided with a depressed ostiole, 16 to 23 μ in diameter. The sessile, fasciculate, recumbent, mostly curved, oblong-cylindrical, hyaline, thin-walled, 8-spored asci measure 40 to 56 by 12·5 to 16 μ. The distichous or subtristichous, elliptic-obovate, hyaline, 1-septate ascospores measure 12·8 to 14·5 by 6·5 μ and are constricted at the septum; the upper cell is slightly broader than the lower one and each contains a large vacuole.

Paraphyses are absent. Globose, punctiform, erumpent, black pycnidia of an *Ascochyta* were present only on young, succulent parts of the host. They measured 80 by 71·5 μ, had a central ostiole and a thin and pseudoparenchymatous wall. The oblong, hyaline, 1-septate pycnospores were obtuse at each end, sometimes slightly constricted at the septum and measured 27·5 to 38·2 by 3 to 3·5 μ. This is believed to be the first record of *M. pinodes* from South Africa.

TORO (R. A.). **The Cercosporae of Puerto Rico.**—*Journ. Dept. Agric. Porto Rico*, xv, 1, pp. 5–17, 1931.

The present list of 76 species of *Cercospora* (of which 3 are new to science) occurring in Porto Rico is stated to be based on a fairly exhaustive review of the relevant literature, as well as on a study of collections (from 1902 onwards) in the Cornell Herbarium and New York Botanical Gardens, and the author believes it to be approximately complete [cf. *R.A.M.*, x, p. 59]. Eleven records are new to the island.

Overzicht van de ziekten en plagen van de Thee over het jaar 1930. [Summary of the diseases and pests of Tea during the year 1930.]—*De Bergcultures*, v, 3, p. 64, 1931.

This survey of the diseases and pests affecting tea in the Dutch East Indies during 1930 contains the following items of phytopathological interest besides those already noticed from another source. The red root fungus [*Ganoderma pseudoferreum* : *R.A.M.*, x, p. 299] occurred on *Deguelia microphylla* [*Derris dalbergioides*], *Erythrina*, *Ficus benjamina*, *Toona sureni*, and *Melia azedarach* in addition to tea on one estate near Buitenzorg. Brown root rot (*Fomes lamaoensis*) was found in 13 estates on tea, 4 times on kapok [*Eriodendron anfractuosum* : ibid., ix, pp. 126, 721], 4 times on lamtoro [*Leucaena glauca*], once on nutmeg [*Myristica fragrans*], and once on *Erythrina*. *Armillaria* [*mellea*] suddenly developed in a severe form on tea seedlings in a nursery in the Pengalengan district [cf. ibid., x, p. 275]. The cobweb fungus (*Corticium theae*) [ibid., x, p. 345] was reported from three estates, on one of which the damage had increased in severity ever since the preceding year.

VALLEAU (W. D.) & JOHNSON (E. M.). **The relation of some Tobacco viruses to Potato degeneration.**—*Kentucky Agric. Exper. Stat. Res. Bull.* 309, pp. 475–507, 5 pl., 1930.

The work described in detail in this paper was carried out at the Lexington Experiment Station, Kentucky, in pursuance of the authors' study of the spread of virus diseases from potatoes to weeds and tobacco [*R.A.M.*, viii, p. 408; ix, p. 402; x, p. 85]. Indirect evidence of this spread is supplied by the observation that veinbanding is of common occurrence in tobacco fields where potatoes were previously grown. Cross-inoculations showed that Irish Cobbler potato plants, whether apparently healthy or diseased, always seem to carry a virus (the 'healthy potato virus') which in tobacco causes a disease characterized by necrotic and chlorotic ring and line patterns. Spot necrosis in tobacco was

caused by inoculations with the viruses of mosaic and interveinal mosaic of Irish Cobbler and of rugose mosaic of Green Mountain potatoes, but transfers from rugose mosaic potatoes or from spot necrosis tobacco plants to partially nitrogen-starved tobacco plants frequently produced only veinbanding. A mixture of the veinbanding and the healthy potato viruses produced in tobacco a spot necrosis identical with that resulting from inoculation with juice from rugose mosaic potatoes. When inoculated into healthy potato seedlings the tobacco veinbanding virus caused a disease characterized by a nearly normal foliage colour with only faint mottling, rugosity, and slight distortion of the leaf. In potato seedlings previously inoculated with the healthy potato virus, the veinbanding virus produced rugose mosaic, and a disease similar to rugose mosaic also resulted when apparently healthy Irish Cobbler potatoes were inoculated with veinbanding virus. Tobacco ringspot (which was shown to be different from healthy potato virus) may infect potatoes, causing a disease similar to aucuba mosaic as described by Quanjer. The tobacco etch viruses were also shown to be transferable to potato, in which they produce a rugose type of mosaic somewhat similar to that caused by the veinbanding virus. Although the work with the cucumber mosaic virus (of which there appear to be at least three strains) did not give conclusive results, other authors have shown it to cause a mosaic in potatoes, and the suggestion is made that potatoes have served to disseminate this virus and that some of the so-called potato degeneration diseases may be caused by it. Finally, two virus diseases were transferred from mild mosaic Green Mountain potatoes to tobacco, one of which is the healthy potato virus, and the other is apparently a mixture of this with another virus, the identity of which has not been determined.

As a result of their investigation, the authors suggest that in areas where potatoes are grown, tobacco might be used in the study of at least a portion of the potato virus population of the local vegetation. Experimental results of other workers also indicate that the aphid *Myzus persicae* might be of valuable assistance in this study, in that it could be used to separate veinbanding, the cucumber mosaics, probably the etch viruses, leaf roll, and perhaps other viruses from mixtures with healthy potato virus [cf. ibid., ix, p. 738]. Conclusive evidence is adduced to show that weeds may play an important part in the dissemination of potato virus diseases, and the proper recognition of this point, together with the development of potato seedlings having the desired qualities and free from viruses, may lead eventually to a practical solution of the potato virus problem.

McKinney (H. H.). **Four apparently undescribed mosaics which go to Tobacco.**—Abs. in *Phytopath.*, xxi, 1, p. 118, 1931.

(1) The concentrated virus of a yellow, mild to medium-intense mosaic produces a lacy type of mottling on tobacco. It does not infect tomato and this plant is not a carrier. It is of medium severity on *Nicotiana glauca*. (2) Another concentrated yellow mosaic virus indistinguishable from the yellow type previously described [*R.A.M.*, vi, p. 193; cf. also ix, p. 260], causes very

intense symptoms on tobacco and tomato. On *N. glauca* this new type is very severe, whereas that previously described is very mild or absent, and its virus is not completely systemic. (3) The virus of a green mosaic with a trace of yellow type is practically indistinguishable from that of the common tobacco mosaic. It is, however, consistently more intense than the latter on *N. glauca*. All these viruses are highly potent over long periods and have high thermal death points. (4) Another green mosaic virus which is free from yellow produces mild symptoms on tobacco. Mottling is most pronounced on the upper ten leaves, fading later and causing characteristic premature yellowing of the older foliage. The mottling is unusually marked on tomato. This type does not infect *N. glauca*. The potency of the virus is low and of brief duration, and it is inactivated at relatively low temperatures.

McKinney (H. H.). **Further studies on virus purification.**—Abs. in *Phytopath.*, xxi, 1, p. 118, 1931.

Twenty-two out of 24 green mosaic viruses studied on tobacco and related hosts were found to contain traces of yellow [see preceding abstract]. In one mixed case the green type was freed from the yellow by successive dilutions and inoculations [*R.A.M.*, viii, p. 189]. These yellow-free green mosaics are distinct from the common type occurring on tobacco, the virus of which the author has not so far succeeded in freeing from traces of the yellow virus by dilution or chemical and physical treatments. The failure of these methods is believed to indicate the existence of a 'virus complex'. Leaves from diseased plants grown near 27° C. with continuous light from Mazda lamps in soil of moderate nitrogen content yield virus extracts low in solids and soluble pigments and high in virus potency. The extraneous solids and soluble materials have been removed from these extracts with comparative ease by contrifuging and temperature coagulation.

Peterson (P. D.). **Plastid pigment and chlorophyllase contents of Tobacco plants as influenced by three types of mosaic.**—Abs. in *Phytopath.*, xxi, 1, p. 119, 1931.

The chlorophyll, carotin, and xanthophyll contents were found to be reduced in tobacco leaves with mild dark green, light green, and intense yellow mosaics [see preceding abstracts]. The greatest reduction of all three pigments resulted from the yellow type and the least from the mild dark green. The chlorophyll content and chlorophyllase activity of normal leaf tissue seemed to be directly correlated, whereas in mosaic plants the reverse was the case; the pale green or yellowed tissues, though lower in chlorophyll content, were higher in chlorophyllase than the darker green leaf tissues.

Silberschmidt (K.). **Der Einfluss der Mosaikkrankheit auf den Nikotingehalt der Tabakspflanze.** [The influence of the mosaic disease on the nicotine content of the Tobacco plant.]—*Ber. Deutsch. Bot. Gesellsch.*, xlviii (I. *Generalversammlungsheft*), pp. (122)-(129), 3 graphs, 1930.

Details are given of the writer's experiments to ascertain the relative nicotine content of healthy and mosaic-diseased tobacco

leaves. Both in the case of growing plants and of cut leaves the nicotine content of the inoculated material was found greatly to exceed that of healthy foliage, in some cases by over 100 per cent. There was no correlation between the increase in the nicotine content and the intensification of the mosaic symptoms. It is suggested that the excess of nicotine in the diseased foliage may be connected with the dissimilation of albumin and the formation of nitrite and formaldehyde [cf. *R.A.M.*, ix, p. 667].

COOK (M. T.). **Undescribed symptoms of mosaic in Porto Rico Tobacco.**—Abs. in *Phytopath.*, xxi, 1, p. 117, 1931.

Small, black spots resembling those caused by fungi have been observed on old leaves of tobacco in Porto Rico. It was found that they were formed in a very few hours during the night on the old leaves of plants suffering from mosaic. The spots are as numerous in the green as in the chlorotic areas, but the mottling usually disappears before they are formed. Cytological studies showed that there had been a rapid disintegration of one or more palisade cells, spreading to the mesophyll. In the final stages the epidermal cells collapse.

WOLF (F. A.). **Epiphytology of Tobacco mosaic in North Carolina.**—Abs. in *Phytopath.*, xxi, 1, p. 118, 1931.

The examination, at fortnightly intervals, of 229 tobacco fields in North Carolina showed that at the beginning of harvest the average percentage of mosaic was 22·7, approximately eight times as high as when the plants became established after transplanting from the seed-beds, of which 85 out of 465 seed-beds examined were infected. By the end of the harvest the percentage of infection had risen to about 95. Man is the primary agent in the introduction of the disease into the seed-beds and its dissemination in the field. The virus overwinters in the stubble of tobacco fields.

KUPRIANOFF (V. A.) & GORLENKO (M. V.). **Растительные паразиты Табака в районе Дрязгинской опытной станции по наблюдениям в вегетационный период 1929 г.** [Vegetable parasites of Tobacco in the region of the Dryazgin Experimental Station, according to observations during the vegetative season of 1929.]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 182–192, 1930. [German summary.]

This paper deals chiefly with the various forms of 'ryaboukha' of Indian tobacco (*Nicotiana rustica*) [*R.A.M.*, ix, p. 1] which were observed in 1929 at the Dryazgin Experimental Station and in the tobacco fields surrounding it. Most prevalent, with an incidence up to 60 per cent. or more, was the form closely resembling American wildfire (*Bacterium tabacum*). It is pointed out, however, that the identity of the causal organism has not yet been established in Russia. Isolations by the authors yielded a very motile, rod-like bacterium. The infectivity of the disease to *N. rustica* was demonstrated by the typical lesions produced on brushing the sap of affected plants on the lower leaf surface of healthy ones, the incubation period being up to 16 days, though in

nature it frequently appeared to be of no more than 10 days. Observations in the field and experiments also indicated that the process of removing the inflorescences from tobacco plants [a method widely used to promote a larger size of the leaves] contributes to the spread of the disease, since the incidence in plants thus treated was about seven times as high as that in plots left for seed, with 80 per cent. leaf infection in the topped as against 12 per cent. in the seed plants. Removing the suckers, on the other hand, did not appear to have any influence either on the spread or development of the disease. No great variations were noticed in the resistance or susceptibility of the *N. rustica* varieties grown at the Station, but the variety Egorka appeared to be the least affected.

The three other forms of 'ryaboukha', which are briefly discussed, were much less frequent and did comparatively little damage. They include a form very similar to ringspot [see above, p. 410] which on Turkish tobacco (*N. tabacum*) may produce leaf spots of a lobed shape or of the 'star and crescent' type; a form in which the spots are diffuse and depressed, and from dark green to brown in colour; and a form very similar to the leaf spotting caused by *Phyllosticta tabaci*, although careful investigation failed to reveal the presence in the lesions of any micro-organism.

The collar rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*] was not very prevalent owing to the climatic conditions of the year, but it was noted that plants left for seed were attacked much more frequently and severely than the main crop plants. Preliminary experiments indicated that the viability of the seed is greatly reduced in plants attacked by *S. sclerotiorum*. Other fungal diseases recorded at the station included a collar rot caused by *Fusarium tabacivorum*, infectious chlorosis, and seedling blight (*Pythium de Baryanum*).

SAMUEL (G.). **Tomato diseases in South Australia and how to control them.**—*Journ. Dept. Agric. S. Australia*, xxxiv, 2, pp. 154–166; 3, pp. 253–272; 4, pp. 369–377; 5, pp. 499–510, 32 figs., 1930.

The author gives a key in which the symptoms of various diseases on the different parts of the tomato plant are briefly indicated. This is followed by full notes on the symptoms, causes, and control of the diseases found on tomatoes in South Australia. These include spotted wilt [*R.A.M.*, x, p. 65]; streak [ibid., ix, p. 747], which in this locality appears to be entirely a glasshouse disease; mosaic; bacterial wilt, which is uncommon in South Australia and the causal organism of which there has not yet been identified; damping-off of seedlings (usually due to *Phytophthora parasitica*, but sometimes caused by *P. cryptogea*, *Pythium* sp., or *Rhizoctonia* [*Corticium solani*]); *Verticillium* wilt (*V. albo-atrum*); black dot root-rot (*Colletotrichum atramentarium*) [ibid., iv, p. 131]; *Fusarium* wilt (*F. lycopersici*) which, though prevalent in Queensland, New South Wales, and Victoria, is not present in the vicinity of Adelaide; root rots due to *Pythium* spp.; leaf spot (*Septoria lycopersici*); early blight (*Macrosporium* [*Alternaria*]

solani) [ibid., vii, p. 411; ix, p. 335] affecting only the Early Dwarf Red variety, on which it confines its activities to the leaves; leaf blight and fruit spot due to *Pleospora* [? *herbarum*]; fruit rot (*Phoma destructiva*); and blossom-end rot.

The lesser known diseases similarly dealt with include watery fruit, pallid leaves, 'buck' plants, and rosette. In watery fruit the flesh is not firm and does not ripen to an even, opaque red; the fruit has a watery appearance, parts of the veins becoming visible, with semi-transparent areas between. The condition appears to result from excessive applications of nitrogenous manure. Pallid leaves are whitish, especially in the central part of the leaflets, though parts of the veins often remain normal in colour. The disease is distinct from mosaic in that there is no leaf blistering or rolling, while the leaves show a general paleness, not a light and dark mottling. The cause is probably associated with nutritional troubles. Buck plants are a form of gigantism in which no flowers or fruit develop. Rosetted plants show an excessive number of side shoots with small, undeveloped leaves at the branch tips; the fruit bunches are stiff, with swollen, abnormal flowers which either do not develop further, or form small, tough, woody fruit. Affected branches sometimes become very thick and swollen below the aborted flowers. Usually only scattered plants are involved, but there have been records of hundreds of plants becoming affected together.

DOOLITTLE (S. P.) & SUMNER (C. B.). **The occurrence of the Australian spotted wilt of Tomatoes in Wisconsin.**—Abs. in *Phytopath.*, xxi, 1, p. 106, 1931.

During the summer of 1930 a virus disease of tomatoes, apparently identical with the spotted wilt occurring in Australia [see preceding abstract], was detected in the field at Madison, Wisconsin. The young leaves developed the typical bronze markings, and the petioles and stem were affected to an extent which sometimes led to the death of young plants. Fruits were also found with the concentric markings characteristic of the Australian disease. The spotted wilt was found to be readily transmissible to tomato by artificial inoculation.

SHAPOVALOV (M.) & LESLEY (J. W.). **Effect of shading on the rate of development of Tomato yellows.**—*Phytopath.*, xxi, 1, pp. 83–87, 1 fig., 2 graphs, 1931.

Further details are given of the experiments carried out in 1929 at Shafter, California, to ascertain the effect of shading on the rate of development of tomato yellows [*R.A.M.*, ix, p. 812]. The data [which are tabulated and discussed] indicate that shading, while affording only partial protection from beet leafhoppers (*Eutettix tenella*), increases the tolerance of the plants to the virus. If continued after the occurrence of infection, shading enables the plants to produce a crop and in some cases facilitates complete recovery from the disease.

SHAPOVALOV (M.). **The growth rate of Tomato plants affected by yellows.**—Abs. in *Phytopath.*, xxi, 1, p. 106, 1931.

Three distinct curves, representing three different types of growth, were obtained by measurements of the rate of elongation of healthy tomato stems and of those inoculated with yellows [see preceding abstract]. Healthy plants, whether inoculated or not, give practically the same rising curve (I). Inoculated plants which developed the disease and failed to recover show a slight lag, followed by a sudden cessation of growth (II). Plants affected in the beginning, but recovering later, are apt to lag at first, then show a rapid rise in growth rate, followed by a gradual increase, as in the controls (III). Shading does not change the types of curves but only the rate of elongation. In the early stages of yellows a slight decrease in the growth rate of diseased as compared with healthy plants often precedes the appearance of other external symptoms. The lag and cessation of growth in these cases are accompanied by a rapid accumulation of carbohydrates and an increase in total nitrogen, indicating that there is no weakening either of photosynthesis or the absorption of nutrient elements from the soil. These phenomena do, however, suggest a serious disruption of the metabolic processes.

BRYAN (MARY K.). **Studies on bacterial canker of Tomato.**—*Journ. Agric. Res.*, xli, 12, pp. 825–851, 1 col. pl., 18 figs., 1930.

This is a detailed account of the author's recent studies of bacterial canker of tomato (*Aplanobacter michiganense*), some results of which have already been noticed [*R.A.M.*, ix, pp. 419, 420; cf. also ix, p. 498; x, p. 136]. The main additional information contained in this paper is an account of the path of the bacteria through the vessels to the seed, which may be internally infected though showing no external signs, and a full description of the cultural and physiological characteristics of the organism, including two variants, namely, the albino strain previously described [ibid., ix, p. 420], and another type observed on whey agar and Thaxter's potato agar. On these media this variant forms small, round, very convex colonies instead of the abundant, fluid, spreading growth of the type form. This kind of colony appeared in small numbers, but was much more common in isolations cultured on the above-mentioned media for some time. Round colonies of younger isolations are very weakly parasitic. No reduction in the pathogenicity of the normal strain to tomato was noticed after five years' culture on nutrient media.

In discussing control measures, it is stated that hot water treatment of the seed has been found impracticable in commercial practice, since the temperatures that kill the bacteria are too close to the point at which the seed is injured. As far as known at present, absolutely clean seed can only be obtained from fields free from the disease. Stress is laid on the importance of seed-bed sanitation, since the conditions in the seed-bed have a considerable bearing on the spread of the disease from plant to plant. Crop rotation is also recommended, as there is evidence that the bacteria are able to overwinter in the soil in some localities.

HUELSEN (W.) & GILLIS (M. C.). **Breeding two new varieties of greenhouse Tomatoes resistant to Fusarium wilt.**—*Illinois Agric. Exper. Stat. Bull.* 361, pp. 408–434, 7 figs., 2 graphs, 1930.

The tomato variety, Marglobe, resistant to wilt (*Fusarium lycopersici*), which is widely grown as a field crop in Illinois [*R.A.M.*, ix, p. 498], is stated to be less successful under glass. Attempts have therefore been made to develop wilt-resistant strains specially adapted to greenhouse conditions by combining certain resistant varieties with Grand Rapids Forcing. These experiments resulted in the production of two promising strains, viz., Lloyd Forcing (a selection of a cross between Louisiana Pink and Grand Rapids Forcing) and Blair Forcing, a pink selection made in the F_3 generation of the above cross. The latter is the more resistent to *F. lycopersici.* Full details of both varieties are given [cf. ibid., x, p. 165].

NESTERTSCHUK (G. I.). **Леса Карело-Мурманского края и их вредители.** [Forests of the Karelia-Murman region and their enemies.]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 159–182, 7 figs., 1930. [German summary.]

In this paper notes are given on the principal insect pests and fungal diseases of forest trees in the Karelia-Murman region [north-west Russia] which were observed in the course of a preliminary survey. Very widespread are stated to be *Trametes pini* [*R.A.M.*, ix, p. 749] and *Fomes annosus* [ibid., x, p. 142] on pines (*Pinus sylvestris* and *P.s.* var. *lapponica*) and firs (*Picea excelsa* and *P.e.* var. *fennica*). In older stands *F. annosus* infects 80 to 100 per cent. of the trees, the rot caused by the fungus extending from 0·5 to 3 m. along the trunks, and occasionally involving the whole of the useful timber. The conifers are also severely attacked by *Peridermium pini* f. *corticola* [ibid., x, p. 145], *Lophodermium pinastri* [ibid., x, p. 280], and *L. macrosporum* [ibid., v, pp. 525, 709]. *Phoma strobiligena* is fairly frequent on the cones of the Siberian pine [*Pinus cembra* var. *sibirica*], the normal development of which is considerably injured by the parasite. Seedling nurseries of the Siberian larch [*Larix sibirica*] and pine in the southern part of the region suffered considerable losses during 1929, caused by *Moniliopsis aderholdi* [see above, p. 384, and also ix, pp. 133, 617]; the fungus is stated to have been introduced quite recently into the region with cabbage seedlings, and to have now firmly established itself in the soil; in some instances whole seed-beds of pine and larch have been practically wiped out by it. Among broad-leaved species, the birch and aspen are severely attacked by *Fomes fomentarius* and *F. igniarius.*

Witches' brooms are very prevalent on all the conifers over the whole of the region, and do particularly heavy damage in the Kola peninsula in stands of over 50 years, the growth in height of which is considerably retarded. The causal organism or organisms of this phenomenon have not been determined.

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DUFRÉNOY (J.). **Les maladies du Peuplier.** [Diseases of the Poplar.]—Imprimerie Commerciale Perrette, Limoges, 1930: reprinted from *Compte Rendu, XIX^e Congrès annuel de l'Arbre et de l'Eau, 1930*, 19 pp., 15 figs., 1930.

This is a short monograph of the diseases that attack the poplar, mainly in France, where the cultivation of this tree is stated to be seriously threatened by some of the troubles, among which the so-called 'bacterial canker' (attributed to *Micrococcus populi*) [*R.A.M.*, x, p. 69] is very prevalent in the north of France and in Belgium. The disease does not kill the trees, but renders the timber useless through the formation of deep longitudinal cracks in the trunks. On poplar twigs the first symptom of canker formation is a slight swelling of the cortex (believed in all probability to correspond to a previous insect injury), under which the wood tissues show considerable alterations. In the affected areas of France the greatest susceptibility to the disease is exhibited by rapidly growing poplar hybrids. Individual trees among cankered ones are occasionally found free from the disease, and the case of a *Populus nigra* tree showing traces of healed cankers is cited as evidencing the existence of individual resistance to the disease in otherwise susceptible species or varieties. Analogous cankers, attributed by Brizi to *Bacillus populi*, have been recorded in Italy on *P. alba, P. nigra*, and *P. tremula*. Good results in the control of the cankers in France are stated to have been obtained by scraping off the cankered tissues, smearing the resulting wound with anthracene oil mixture (either alone or with the addition of Bordeaux mixture), and applying from 2 to 5 kg. of a phosphate manure to the base of the tree.

Dothichiza populea [ibid., vii, p. 285] occurs in south-west France chiefly on *P. angulata* and in Italy on *P. deltoides*. In recent years, however, it has been found attacking various hybrids in different regions of France, more particularly in the neighbourhood of Paris. It is especially dangerous to cuttings and young trees which have not yet developed a large root system, and it is recommended that young poplars should only be planted out in soil that retains water throughout the year without being waterlogged. Cuttings should be only taken from trees free from cankers or any

suspicious discolorations of the bark. In infected plantations all diseased material should be immediately removed and burnt.

Cytospora chrysosperma [the pycnidial stage of *Valsa sordida*: ibid., x, p. 349] does not appear to be able to attack the shoots of vigorous poplars in Europe, but to parasitize trees weakened by lack of water, severe pruning, or any other cause. This fungus is known to attack ten species of *Populus*, various species of willow [*Salix*], and some maples [*Acer*].

The leaf diseases of poplars briefly mentioned include *Didymosphaeria populina*, *Napicladium tremulae*, *Taphrina aurea* [ibid., ix, p. 408], and the rusts *Melampsora pinitorqua* [ibid., viii, p. 344], *M. laricis* [*M. larici-populina*: ibid., ix, p. 65], *M. allii-populina*, and *M. rostrupii*.

RÉGNIER (R.). **Le chancre du Peuplier.** [Poplar canker.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 1, pp. 40–47, 1931.

A popular account is given of the canker of poplars attributed (probably incorrectly) to *Micrococcus populi* [see preceding abstract], which is stated to be present in the following departments of France: Aisne, Oise, Seine-et-Marne, Aube, and Seine-Inférieure. Emphasis is laid on the very severe character of the disease and recommendations are made for its control by cultural measures.

SCHREINER (E. J.). **Two species of Valsa causing disease in Populus.**—*Amer. Journ. of Botany*, xviii, 1, pp. 1–29, 5 pl., 1 graph, 1931.

A detailed account is given of the writer's investigations in New England and New York on the poplar cankers caused by *Valsa sordida* [*R.A.M.*, x, p. 349] and *V. nivea*.

The mycelia of single ascospore cultures of *V. sordida* always produced the pycnidia of *Cytospora chrysosperma*, while *C. nivea* was constantly obtained from similar cultures of *V. nivea*. *V. sordida* is apparently the more vigorous parasite of the two. Both species grew on various agar media and on sterilized twigs of 29 species in 19 genera of eight families of plants [which are listed]. It is evident, therefore, that these fungi may occur in a saprophytic form on a wide range of substrata. Perithecia were not obtained in any of the cultures.

The average diameter of the body of the black, flask-shaped, thin-walled perithecia of *V. sordida*, found on *Populus tremuloides* in Pennsylvania and *P. maximowiczii* in Maine in the autumn of 1929, is 0·5 mm., and the length of the neck 0·5 to 0·6 mm. The narrow, clavate, sessile or very short stipitate asci measure 26 to 43 by 4·3 to 6·4 μ (average 33 by 5·2 μ or 40 by 5·2 μ, including the base); the 8 hyaline, allantoid ascospores range from 6·6 to 10·9 by 1·3 to 1·7 μ (average 9 by 1·5 μ). The perithecial stage of *V. nivea* was only once found by the writer on dead branches of *P. tremuloides* in Nova Scotia in the autumn of 1929. The average diameter of the body is 0·3 to 0·4 mm. and the length of the neck 0·4 to 0·6 mm. The clavate, subsessile asci measure 23 to 38 by 4·3 to 5·3 μ (average 30 by 5 μ), and the 8 hyaline, allantoid spores, 7 to 9·1 by 1 to 1·6 μ (average 8 by 1·3 μ). The

hyaline, allantoid pycnospores of *C. chrysosperma* measure 3·7 to 5·4 by 0·8 to 1·1 μ (average 4·5 by 0·93 μ) and the similar ones of *C. nivea* 4·3 to 5·9 by 0·8 to 1·1 μ (average 5 by 1 μ). Both the ascospores and pycnospores of *V. nivea* swell excessively and become spherical before germination. Both *V. nivea* and *V. sordida* grew best at 25° C. on poplar decoction agar; the former did not develop at 4° or 35°. The capacity of *V. sordida* to develop at 4° explains the severe damage caused by this fungus to dormant poplar cuttings [loc. cit.], which should be kept in storage bins at 2° in order to prevent infection. The mycelium of *V. nivea* is darker and less dense than that of *V. sordida* and grows more slowly. The ascospores of *V. sordida* germinate more rapidly than those of *V. nivea*, but they do not become spherical, and the mycelium is usually white. In *V. sordida* especially, single ascospore cultures gave rise to different types of mycelia varying in growth rate and amount and earliness of pycnidial formation, a phenomenon suggesting the existence of distinct strains of this fungus.

Inoculation experiments with mycelium and spores of *V. sordida* resulted in the infection of young branches and of the trunks of young trees, but only through wounds in the bark. Two extreme types of infection were observed. In trees of poor growth the fungus developed in the bark and wood, killing the cambium and often destroying the branch or even the whole tree. On vigorous trees either the wound healed directly or a small canker was formed that subsequently healed over, but in either case the underlying wood was brown, and tissue cultures taken from this wood up to two years after inoculation gave living mycelium.

DAVIS (W. H.). **Corynose twig blight of the American Bladder Nut.**—Abs. in *Phytopath.*, xxi, 1, p. 126, 1931.

During 1929–30 a severe twig blight of the American bladdernut (*Staphylea trifolia*) was observed in Massachusetts, some of the smaller shrubs being killed and half the current year's growth of others destroyed. Isolation and inoculation experiments revealed a pathogenic fungus, the hyphae of which entered the meristematic tissues of the twigs at the tips, nodes, or leaf axils. The fungus is considered to be a variety of *Coryneum microstictum* [*R.A.M.*, vii, p. 699] and named *C. microstictum* var. *staphyleae*. The conidia are subpyriform, measuring 18 by 6 μ (15 to 17 by 5 to 6·5 μ for *C. microstictum* according to Saccardo), with an obtuse apex and four loculi, the lowest subhyaline and the remainder honey-coloured; the filiform, hyaline conidiophores measure 19 by 1·3 μ (20 to 25 by 1·5 μ in the type species).

KUJALA (V.). **Über die Krankheiten des Abies sibirica in Finnland.** [On the diseases of *Abies sibirica* in Finland.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlii (*Jahrb.*), pp. 380–382, 1930.

Abies sibirica in Finland is widely affected by a disease in which the topmost shoots of the trunk and upper branches wilt and die during the autumn and winter; in the following summer the black, punctiform fruit bodies of an as yet unidentified fungus appear on the dead areas. A peculiar feature of the disease is its intensive occurrence in one stand while those immediately adjacent

may remain quite healthy. A similar phenomenon has been observed in *Picea excelsa*, *A. concolor*, *Pinus strobus*, *P. sylvestris*, *Sorbus* [*Pyrus*] *aucuparia*, and *Alnus incana*. It is thought that climatic and physiological factors may be the primary cause of the disease, probably assisted by fungi introduced into the country with foreign conifers.

Abies sibirica and *A. balsamea* are further subject to the combined attacks of an aphid and *Apiosporium pinophilum* [*R.A.M.*, v, p. 146], which have completely destroyed the trees in various parts of the country.

A group of old *A. sibirica* trees was recently affected by a disease in which numerous longitudinal, brick-red streaks, a few centimetres in width, ran from the base to the top and extended to the branches; the cortex and the underlying wood were dead. The needles assumed a brown discoloration but remained on the tree. Small, sooty spots, attributed by Liro to *Coniothecium effusum* [ibid., vii, p. 22], appeared on the dead areas of the bark during the summer.

CORAX. **Die Wahrheit vom Heidesterben.** [The truth about the dying-off of Heather.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xlii (*Jahrb.*), p. 379, 1930.

The extensive dying-off of heather (*Calluna*) [*vulgaris*] in various districts of North Germany (especially the Lüneburger Heide), which has been attributed to a fungus [*Stemphylium ericoctonum*] and to the extremely severe winter of 1928–9 [*R.A.M.*, x, p. 159], is now reported to be due to the attacks of a beetle, *Lochmaea suturalis*.

LEPIK (E.). **Metsakahjulikud puumädanikud.** [The wood rots injurious to silviculture.]—*Eesti Metsanduse V Aastaruamatust*, pp. 110–129, 1931. [Esthonian, with German summary.]

The wood-rotting fungi of economic importance may be divided into three groups, viz., (1) those causing ‘corrosion’ rots, dissolving pectin and pentosans, represented in Esthonia by *Lenzites abietina*, *L. sepiaria*, and many species of *Stereum*; (2) the causal organisms of ‘destruction’ rots (chiefly *Merulius domesticus* [*M. lacrymans*]); and (3) *Ceratostomella* spp., responsible for blue stain, which are fairly widespread in the country. The natural protective substances contained in the wood, i. e., resins, alkaloids, and tannins, are most abundant, under Esthonian conditions, during the period from December to March, inclusive, and felling should therefore be carried out at this time. Artificial protection by impregnation with the phenolates derived from shale-oil has given good results in Esthonia.

The most important wood-rotting fungi in Esthonia are listed. *Fomes igniarius* is stated to cause heavy damage in Esthonian aspen [*Populus tremula*] forests, where 100 per cent. of the trees in old stands may be attacked, leaving at the most 15 to 20 per cent. of the timber fit for use in the important match industry.

This paper was followed by a discussion, which is reported on pp. 129–132.

Drechsel (W.). **Ueber Schimmelpilzbildung auf Sulfitzellstoff, die dadurch bedingte Faserschädigung und Cellulosezersetzung.** [On mould formation on sulphite pulp and the resulting injury to fibre and cellulose disintegration.]—*Papier-Fabrikant*, xxviii, 45, pp. 709–713; 46, pp. 729–736; 50, pp. 848–854, 1930; xxix, 1, pp. 5–9, 16 figs., 1 diag., 2 graphs, 1931.

A comprehensive account is given of the writer's experiments at Dresden on the action of a number of moulds during their growth on unbleached and bleached sulphite pulps. Pure cultures of species of *Penicillium*, *Cladosporium*, and *Aspergillus* were used, and their development on pulps examined microscopically in moist chambers. In the majority of cases the fibres are attacked and reduced to amorphous masses. Since nutrient media, other than the pulps, are rigorously excluded the growth of the moulds ceases after varying periods up to 20 days. Bleached pulps were found to yield microscopic crystals of calcium oxalate, oxalic acid being a product of the action of the moulds. These crystals were absent from unbleached pulps, the calcium content of which is low. The principal products of the action of the moulds are carbon dioxide, organic acids, humic substances, and traces of dextrose.

The formation of carbon dioxide was used as a means of gauging the extent of the action on the fibres, a stream of sterile air free from carbon dioxide being passed through the inoculated pulp under investigation, and the carbon dioxide determined in the effluent air. Unbleached pulps were found to yield greater quantities of carbon dioxide than bleached samples on a 75-day test, the curve for daily production of the gas showing a high peak in the former case after 20 to 30 days. Similar experiments carried out in a stream of nitrogen yielded negative results. The loss in weight after washing the affected pulps with water ranges from 3 to 6 per cent. Photomicrographs show the action of the moulds at various stages, and the statistical data are tabulated.

Weber (G. F.). **Bottom rot of Cabbage caused by Corticium vagum.**—Abs. in *Phytopath.*, xxi, 1, p. 117, 1931.

During the winter of 1930 cabbage in low-lying and damp situations near Gainesville, Florida, was attacked in a destructive fashion by *Corticium vagum* [*C. solani*: *R.A.M.*, ix, p. 179]. The first symptoms of the disease (which is believed to be new) are a browning and dying of the leaves at the basal portion of the head. If the plant is attacked early, the fungus grows rapidly into the head, but if the latter is older and more compact the outer leaves are invaded and killed. The disease appears to be an extension of wire stem, in which the fungus grows up the stalk under humid conditions and attacks the succulent tissues of the leaf blade. Inoculations with pure cultures of *C. solani* resulted in the reproduction of the disease on potted greenhouse plants.

Bondartzeva-Monteverde (Mme V. N.) & Vassilievsky (N. I.). **Аскохитоз Гороха и других бобовых.** [Ascochytosis of the Pea and other legumes.]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 8–11, 1930. [English summary.]

After a brief summary of the present state of knowledge of the

species of *Ascochyta* and *Mycosphaerella* which attack peas and other legumes in America [*R.A.M.*, ix, p. 273; x. p. 7], the authors state that the examination of samples of pea seeds from various centres in Russia showed that identical or similar diseases are widespread there. Besides *A. pisi* and *M. pinodes*, isolations yielded a form of *Ascochyta* and a form of *Mycosphaerella* which apparently have not been described hitherto, and which are now being studied in pure culture and in inoculation experiments. Work is also being conducted to determine the host range of the species from the pea, and also the taxonomic status of species of *Ascochyta* occurring on other cultivated and wild legumes [ibid., x, p. 409].

HAENSELER (C. M.). **The use of fertilizer in reducing losses from Pea-root rot caused by Aphanomyces euteiches.**—Abs. in *Phytopath.*, xxi, 1, pp. 116–117, 1931.

The incidence of pea root rot caused by *Aphanomyces euteiches* [in New Jersey] was delayed and the injurious effects on the host greatly mitigated by the proper use of fertilizers [*R.A.M.*, x, p. 12]. Plots receiving 2,000 lb. per acre of a complete fertilizer gave 72·7 per cent. increase in plant height and 111·5 per cent. increase in yield. An application of 1,000 lb. per acre augmented the size and yield by 41·8 and 89·3 per cent., respectively. In another test, yield increases of 94 to 206 per cent. on root rot-infested soil resulted from different fertilizer treatments, largely in consequence of retardation in the development of the disease. Nitrate of soda, sulphate of ammonia, and muriate of potash were shown by greenhouse tests to be more effective for this purpose than superphosphate.

ZAUMEYER (W. J.). **Comparative histology of three bacterial blights of Beans in the seedling stage.**—Abs. in *Phytopath.*, xxi, 1, p. 115, 1931.

Bacterium flaccumfaciens may be differentiated from the causal organisms of two other bean [*Phaseolus vulgaris*] blights, viz., *Bact. phaseoli* and *Bact. medicaginis* var. *phaseolicola* [*R.A.M.*, x, p. 357], by the facts that it is Gram-positive and invades the xylem cells to a greater extent than those of the parenchyma. The other two bacteria are Gram-negative and occur chiefly in the parenchymatous tissues, where they produce large cavities near the cotyledonary node; they may migrate through the intercellular spaces to the surrounding tissue and enter the xylem cells, travelling upwards through the plant and often causing the death of the growing tip. *Bact. flaccumfaciens* may likewise break out from the vascular tissue, producing lysigenous cavities contiguous to the vascular strands, but it does not readily migrate into the surrounding parenchymatous tissues.

KOTTE (W.). **Zur Kenntnis der 'Fettfleckenkrankheit' der Bohne.** [Contribution to the knowledge of the 'grease spot disease' of the Bean.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 1, pp. 12–19, 1931.

Experiments have been conducted at the Baden (Germany)

Plant Protection Station in the control of the 'grease spot disease' of beans [*Phaseolus vulgaris*] due to *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, x, p. 219] by the disinfection (30 minutes' immersion in 0·25 per cent. uspulun) of heavily contaminated Flageolet Rote Pariser seed prior to sowing on 20th May. At the first inspection of the stand on 13th June the incidence of infection was found to have been reduced from 43 per cent. in the untreated controls to 19 per cent.; by the time of the second (26th June) there had been a considerable spread of secondary infection, and the percentage of diseased plants in the treated stand was 62 compared with 95 in the untreated. These data indicate that seed disinfection, while unlikely to ensure complete control, may prove valuable in conjunction with the use of selected seed.

The results [which are tabulated and discussed] of inoculation experiments on a number of standard commercial varieties of *P. vulgaris* showed that the most highly susceptible is the Flageolet Rote Pariser, followed by Karlsruher Markt, Hundert für Eine, and Non Plus Ultra. A fair number of the varieties were immune or highly resistant, including several types of sugar bean, Juli, Don Carlos, an improved Wachs Flageolet with variegated seeds, Wachs Neger, Rheinische Speck, and the stringless beans Wachs Gloria, Goldkrone, and Schlachtschwert. Two varieties of *P. multiflorus* tested, viz., Weisse Königin and Englischer Riesen, and the green Windsor broad bean (*Vicia faba*) were immune.

HARTER (L. L.) & ZAUMEYER (W. J.). **A wilt of Beans caused by Pythium.**—Abs. in *Phytopath.*, xxi, 1, pp. 115–116, 1931.

During a very hot spell in July, 1930, seedling beans [*Phaseolus vulgaris*] of the Late Stringless Green Refugee variety at Arlington, Virginia, and Greeley, Colorado, were affected by a wilt disease due to *Pythium butleri* [*R.A.M.*, ix, p. 612; x, p. 211]. The first symptoms were observed at soil level, whence the decay extended upward into the lower branches. The cortex readily separated from the vascular tissues. The rot was particularly conspicuous at the pulvini of the petioles and leaflets. A slight flagging of the leaves during the day was soon followed by distinct wilting and death. Successful inoculation and reisolation experiments were carried out on Refugee beans in the greenhouse. Wilting did not occur at ordinary greenhouse temperatures but developed in about three days on plants kept at 30° C.

REYNOLDS (E. S.) & MILLER (B. S.). **Plant extracts and fungi. II. Bean extracts in relation to Colletotrichum lindemuthianum.** —Abs. in *Phytopath.*, xxi, 1, p. 124, 1931.

Extracts were made from bean [*Phaseolus vulgaris*] plants which had been dried artificially at about 80° C. and then ground to a fine powder. An amount of water equivalent to the water content of the growing plants was used and mineral salts and glucose were added. Liquid cultures made with these extracts from certain varieties of young bean plants were found to prevent the growth of *Colletotrichum lindemuthianum*. Agar plates made with similar extracts permitted a slowly developing growth.

Control cultures with minerals and glucose in the same proportions as used in the bean extract ones produced a good growth.

LACKEY (C. F.). **Virulence of attenuated curly-top virus restored by Stellaria media.**—Abs. in *Phytopath.*, xxi, 1, pp. 123–124, 1931.

The virulent form of beet curly top virus, attenuated by passage through *Chenopodium murale* [*R.A.M.*, ix, p. 356], has been restored to approximately its original strength by passage through *Stellaria media.* Thus, the percentage of beets contracting curly top as a result of inoculation with the restored virus was 74, compared with 64 for the original and 25 for the attenuated, the average incubation periods being 9·9, 9·5, and 13·1 days, respectively. *Erodium cicutarium* is an important host of *Eutettix tenella,* the insect vector of the disease, in California during the winter and early spring and plays a significant part in the overwintering of the virus.

ELCOCK (H. A.). **Phytomonas beticola.**—*Phytopath.*, xxi, 1, pp. 13–40, 2 figs., 1931.

The bacterial pocket disease of beets, caused by *Phytomonas* [*Bacterium*] *beticola* [*R.A.M.*, viii, p. 541], has been reported since 1926 from various localities in the Arkansas Valley, as well as from Lowell, Wyoming. The disease thus appears to be fairly generally distributed in the western beet area (where the incidence of infection may amount to 10 per cent.), but so far the only record of its occurrence in the east is from Rosslyn, Virginia.

Comparative analyses [the data of which are tabulated] of diseased and healthy beets showed that the sugar percentage and purity of the former are greatly reduced by the attacks of *Bact. beticola.*

The bacterial pocket organism (the differences between the symptoms caused by which and *P.* [*Bact.*] *tumefaciens* are shown in a table as an aid to prompt field diagnosis) enters the host through wounds inflicted by cultivating implements, hail, and the like. It is capable of overwintering both in the overgrowths and as a free-living organism in the soil. In soil isolations the organism was identified by means of the agglutination test, confirmed by inoculation experiments on sugar and garden beets. Serological tests with a number of other bacteria, including *Erwinia carotovora* [*Bacillus carotovorus*], *E. atroseptica* [*B. phytophthorus*], and *E. amylovora* [*B. amylovorus*], showed that the agglutination reaction of *Bact. beticola* is specific, and sera of high titre are useful for diagnostic purposes when agglutination is strongly positive at high dilutions. Two strains of the organism were serologically independent in their agglutination reactions, so that negative results of agglutination tests should not be interpreted as evidence of specific difference.

One strain of *Bact. beticola* was found to manifest dissociation by variability in colony type, corresponding to the rough and smooth types described for other species [cf. ibid., vii, p. 192]. Subcultures of each type remained fairly constant when 24-hour transfers were made, but 20-day-old cultures, originally of the S

type, showed about 41 per cent. R type colonies in repeated tests. Where the parent was of the R type a very small proportion (average 2 per cent.) of the colonies from 20-day-old cultures were of the S type. The latter appeared to possess fewer antigenic properties than the smooth cultures. When used in a precipitin test with an R antiserum, both the R and S antigens gave identical results. Both forms are pathogenic to sugar beets, but the largest overgrowths were produced by the R type.

STEHLIK (V.) & NEUWIRTH (F.). **Ökologie der aufgehenden Rübe mit Berücksichtigung ihrer Krankheiten.** [Ecology of the growing Beet with respect to its diseases.]—*Zeitschr. für Zuckerind.*, Prague, lv, 20, pp. 207–214, 1931.

This is a German translation of the authors' paper on the relation between ecological factors and some beet diseases, especially seedling diseases caused by *Pythium de Baryanum* and *Phoma betae*, originally published in *Listy Cukrovar.*, xlvii, p. 729, 1929, an abstract of which has already been noticed [*R.A.M.*, ix, p. 222].

S. **Tierische und pflanzliche Speicherschädlinge des Rübensamens.** [Animal and vegetable storage pests of Beet seed.]—*Centralbl. für Zuckerind.*, xxxix, 5, p. 120, 1931.

A brief account is given of the data obtained in four years' investigations at Winnitza, Podolia [Ukraine], on the incidence of animal and vegetable pests on stored beet seed. The principal fungi detected by the phytopathologist Borisiewitch were *Phoma betae, Ascochytella chenopodii, Ascochyta betae* [*R.A.M.*, v, pp. 273, 699; vii, p. 222], *Fusarium betae, F. falcatum, F.* No. 4, *Alternaria tenuis, Cladosporium herbarum*, and *Oospora betae*. It was found that the three first-named organisms infect the ripening beet-clusters while *A. tenuis* and *C. herbarum* develop immediately after the flowering of the seed-bearers, hence the presence of their mycelia deep in the seed coats. Root rot [see next abstract] was shown by inoculation experiments to be produced by a group of the above-mentioned fungi. The strains of *A. tenuis* isolated from beet seed were found to be much more virulent than those of the same fungus from clover. Seed treatment with fungicides, e.g., germisan, uspulun, tutan, 225, 225 U, 275, and formalin, reduced the incidence of root rot, though not always to a significant extent. Good results in the control of root-rotting organisms was also obtained by heating the seed for one to three hours at 70° C.

STEPANENKO (A. G.). **Отношение к корнееду различных марок Сахарной Свеклы.** [Reaction of various strains of Sugar Beet to root rot.]—*Наукові Записки з Цукрової Промисловости* [*Sugar Industry Scient. Notes*], Kieff, x, 3–4, pp. 325–336, 1930.

The results of laboratory and field tests in 1928 and 1929 at Kieff [Ukraine] indicated the absence in a number of sugar beet strains originating from different localities of any marked difference in susceptibility to seedling root rot [*R.A.M.*, iv, p. 391; ix, p. 696]. Isolations from diseased seedlings of all the strains yielded fairly consistently the same species of fungi, among which *Phoma betae*

was by far the most prevalent; next in order of incidence were three strains of *Fusarium*, followed by species of *Cephalosporium* and *Alternaria* [see preceding abstract]; a species of *Botrytis* was also found in individual seedlings, forming small appressoria on the rootlets.

The pathogenicity of *P. betae* was abundantly proved in experiments in which surface-disinfected seed was inoculated with pure cultures of the fungus; all the beet strains tested reacted practically uniformly to the disease. The three strains of *Fusarium* [a brief morphological description of which is given] were shown to be very slightly, if at all, pathogenic.

PANASSENKO (V. T.). Про деякі види грибів із порядку Mucorales, що викликають гниття кагатів. [Certain species of fungi of the order Mucorales which cause storage rot.]—*Наукові Записки з Цукрової Промисловости* [*Sugar Industry Scient. Notes*], Kieff, x, 3–4, pp. 337–345, 8 figs., 1930.

Brief descriptions are given of eight species of Mucoraceae which the author isolated from rotting sugar beets in storage in the Ukraine, namely, *Mucor circinelloides*, *M. dimorphosporus*, *M. erectus*, *M. janssenii*, *M. hiemalis*, *M. racemosus*, *Rhizopus arrhizus*, and *R. nigricans*. Inoculation experiments under laboratory and storage conditions showed that *R. nigricans* is the most active and may cause considerable losses in sugar beets stored under high temperature conditions. With the exception of *R. nigricans* (which failed to develop), all the other species gave a slight growth at temperatures from 3·6° to 5° C., but the rot induced by them at these temperatures did not appear to be of any economic importance.

PIDOPLITSCHKA (M.). Мікологічні дослідження сушеної Бурякової краянки. [Mycological investigation of dried cut Sugar Beetroots.]—*Наукові Записки з Цукрової Промисловости* [*Sugar Industry Scient. Notes*], Kieff, x, 3–4, pp. 346–364, 1 pl., 1 fig., 3 graphs, 1930.

The investigation reported in detail in this paper was made in the laboratory of the Scientific Research Institute of the Sugar Industry in Kieff [Ukraine] for the purpose of determining the optimum conditions for the storage of dried cut sugar beetroots. The results showed that at temperatures of 5° to 6° C., independently of the relative humidity of the atmosphere, the only organisms that developed on moist beet cuttings were red species of *Torula* and one species of *Aspergillus*. At 10° there was a slow but uniform growth of bluish-green species of *Penicillium*, while at room temperature the fungal flora on the cuttings was represented by numerous moulds. At 35° only bacteria developed. Below 20 per cent. moisture content the cut beets were found to be fairly safe from attacks by all micro-organisms, but above this point species of *Aspergillus* developed freely and remained predominant up to 30 per cent. moisture content, when they were superseded by other, more rapidly growing moulds, e.g., *Trichoderma*, *Gliocladium*, *Rhizopus*, *Mucor*, *Trichothecium*, etc. All these fungi were shown to be highly injurious to the sucrose

content of the beets. At moisture contents above 45 per cent. bacteria were predominant. The optimum moisture content for preservation was determined to be between 8 and 10 per cent. Further experiments showed that dried cut beetroots are highly hygrometric, readily absorbing moisture from the air. For this reason, it is recommended that they should be stored in layers as thick as feasible, since it was shown that under ordinary storage conditions moisture from the atmosphere, although rapidly absorbed by the exterior layer, is slow to penetrate into the interior of the stacks, and that by removing an outside layer of some 25 cm. thickness approximately every 50 days, the organisms may effectively be kept under control.

The paper terminates with brief descriptions of eight species of moulds, which a preliminary examination showed to be predominant among the 48 species recorded on the cut beetroots examined. These are *Rhizopus nigricans*, *Aspergillus glaucus*, *A. niger*, *Penicillium verticillioides* (which the author renames *Gliocladium verticillioides* (New.) comb. n., with *G. salmonicolor* as a possible synonym), *P. rubrum*, *P. rugulosum*, *Trichoderma lignorum*, and *Trichoderma* 29.

COSTA (T.). **Su alcune prove di lotta contro la Cercospora beticola eseguite a Mónzon per conto della Compagnia de Industrias Agricolas.** [On some experiments in the control of *Cercospora beticola* conducted at Mónzon on behalf of the Company of Agricultural Industries.]—*Indus. Sacc. Ital.*, xxiv, 1, pp. 12–16, 1931.

The writer discusses and tabulates the results of experiments carried out in 1930 at Mónzon (Spain) in the control of beet leaf spot (*Cercospora beticola*). The most satisfactory treatment as regards yield was an application of 5 per cent. Bordeaux mixture every ten days between 10th July and 20th September [cf. *R.A.M.*, ix, pp. 154, 696, *et passim*], while the greatest increase in the sugar content was obtained by 2 per cent. Bordeaux mixture every ten or twenty days from 1st June to 30th September. The other treatments (1 per cent. Bordeaux mixture and 5 per cent. Caffaro powder) were somewhat less effective.

MELHUS (I. E.) & VESTAL (E. F.). **The comparative value of checking and drilling in the control of Cercospora leaf spot and yield of Sugar Beets.**—Abs. in *Phytopath.*, xxi, 1, p. 122, 1931.

By increasing the space between sugar beet plants from 12 to 20 inches, the humidity was reduced from 10 to 3 per cent., soil moisture increased about 1 per cent., evaporation increased 3·6 c.c. per diem, and wind velocity augmented 10 ft. per minute as compared with the normally spaced beets. All these factors tend to decrease the incidence of leaf spot (*Cercospora*) [*beticola*: see preceding abstract] and to increase yield, as shown by the fact that the normally thinned beets contained six times as many natural infection centres and 1,960 lb. less yield per acre than the checked ones. Analyses of sugar beets from both types of thinning showed a purity of 82·5 and a sugar percentage of 14·56 for the checked,

compared with 80·5 and 15·61 for the drilled; the increased tonnage of the checked plants more than offset the higher sugar content of the drilled. Checked beets, thinned to one double every other place, and every third place, yielded 33,184 and 33,679 lb. per acre, respectively, compared with 32,788 and 29,745 lb. per acre, respectively, for checked beets thinned to one to a place and normally drilled plants.

STEWART (D.). **Sugar-Beet yellows caused by Fusarium conglutinans var. betae.**—*Phytopath.*, xxi, 1, pp. 50–70, 3 figs., 1 graph, 1931.

Sugar beets in the Arkansas Valley have recently become affected by a disease to which the name 'yellows' is applied, the symptoms being similar to those of cabbage yellows [*Fusarium conglutinans*: *R.A.M.*, x, p. 72].

The most conspicuous leaf symptom is a yellowing of the mature, and later of the young, foliage. Wilting does not seem to occur in large plants in nature, but frequently follows the inoculation of greenhouse plants with little or no yellow discoloration. Sections through the roots of affected individuals reveal a greyish-brown discoloration and rot of one or more rings of the vascular tissue. Infection can often be traced to its starting-point, 5 to 8 inches below ground level, in a lateral root, through which entrance is apparently gained rather than through wounds. Diseased seedlings may show a typical wilt without yellowing or they may exhibit the symptoms of discoloration and rotting of the vascular system described for larger plants.

Beet yellows has been found to cause a marked reduction in the sugar percentage as well as in the weight of the roots. The average sugar percentage of 15 healthy beets collected in 1927 near Rocky Ford, Colorado, was $12{\cdot}00 \pm 0{\cdot}27$ compared with only $7{\cdot}67 \pm 0{\cdot}37$ for the same number of diseased ones, while the average weight of the roots was $895{\cdot}9 \pm 37{\cdot}93$ gm. in the former group and $353{\cdot}0 \pm 39{\cdot}59$ gm. in the latter.

The causal organism of beet yellows was shown to be a species of *Fusarium* resembling *F. conglutinans* and *F. conglutinans* var. *callistephi* [ibid., ix, p. 510], but differing sufficiently both in morphology and pathogenicity to be regarded as a distinct variety, which is tentatively named *F. conglutinans* var. *betae* n. var. The microconidia are hyaline or greyish in mass, 7 to 12 by 2 to 3 μ, mostly continuous, straight or slightly curved; the terminal or intercalary chlamydospores are globose to ovoid; and the mycelium cottony-white, making profuse aerial growth. There is no pigment production on steamed rice. The optimum temperature for growth on potato-dextrose agar was found to be 24° to 27° C., with an optimum reaction on the acid side of the neutral point.

Comparative tests in which beet seedlings were grown in sterilized soil inoculated with *F. conglutinans* var. *betae*, *Corticium vagum* [*C. solani*], and *Pythium de Baryanum* showed the first-named to be a virulent pathogen but somewhat slower in its action than the other two. The pathogenicity of *F. conglutinans* var. *betae* appears to be restricted to beets.

HENDERSON (W. J.). **Varietal susceptibility, distribution, and control of yellow dwarf of Onions.**—Abs. in *Phytopath.*, xxi, 1, p. 123, 1931.

Field tests in 1929 and 1930 on 35 onion varieties in Iowa showed that the Sweet Spanish group possesses a high degree of tolerance to yellow dwarf, a transmissible virus disease overwintering in the sets and mother bulbs [*R.A.M.*, ix, p. 223]; they are, however, not suited to local conditions. The same disease has also been reported from West Virginia (where it was apparently present as early as 1916) and California. The incidence of yellow dwarf in the Pleasant Valley district was reduced from 45 and 20 per cent. in 1928 and 1929, respectively, to 1 per cent. in 1930 by indexing onion sets and isolating the set plots. The greenhouse method of indexing is being replaced by a water-culture, in which the sets and mother bulbs are grown on a coarse wire screen resting on the surface of a dilute nutrient solution.

BLATTNÝ (C.). **Příspěvek k seznání fusariosy na Cibuli (Allium cepa).** [Contribution to the study of fusariosis of Onion (*Allium cepa*).]—*Ochrana Rostlin*, x, 6, pp. 149-153, 2 figs., 1 graph, 1930.

The author states that the examination in 1929 of onion seed samples originating from Germany, Hungary, and France, showed that 27 per cent. were infected with two strains of *Fusarium*, one of which entirely agreed with *F. cepae* as described by Tomsa [*R.A.M.*, viii, p. 351]. The second strain produced on malt agar an abundant white aerial growth, dark brownish-orange sporodochial pionnotes, and discoloured the substratum to dark brown; in 45-day-old cultures its macroconidia are elongated, slightly bent, mostly three- (rarely four-) septate, and average 40·92 by 4·95 μ (maximum 65 by 5·2 μ) in diameter. Seeds infected with one or both of the strains, either failed to germinate or the seedlings grown from them soon perished. Preliminary experiments indicated that both fungi are able to live in the soil on onion débris, and to cause soil infection of young onion plants. Besides the damage done to onions in the seed-bed and in the field, the fungi are also dangerous as the cause of a serious storage rot and they further stimulate stored onions to premature sprouting.

DOOLITTLE (S. P.). **Commelina nudiflora, a monocotyledonous host of Celery mosaic.**—Abs. in *Phytopath.*, xxi, 1, pp. 114-115, 1931.

A mosaic disease responsible for serious losses in the Florida celery crop [*R.A.M.*, iii, p. 77; iv, p. 393] is stated to differ in certain respects from the ordinary mosaic on this host. An unusual feature of the disease is its frequent occurrence on the monocotyledon *Commelina nudiflora*, whence it is transmitted both to celery and cucumber by *Aphis gossypii*. The disease is further transmissible by artificial inoculation to cucumber, tomato, tobacco, pepper [*Capsicum annuum*], and ground cherry [*Physalis* sp.], the symptoms resembling those of cucumber mosaic [ibid., x, p. 410], with which the celery virus is thought to be identical. The early symptoms are a pronounced leaf mottling and a down-

ward, spreading curvature of the petioles, some of which develop extensive brown, sunken streaks that are typical of the disease. In the later stages of the disturbance the only symptoms are slight mottling and dwarfing, sometimes with intermittent browning of the petioles which may render the plants unmarketable.

COCHRAN (L. C.). **Two Septorias as a cause of late blight on Celery.**—Abs. in *Phytopath.*, xxi, 1, p. 115, 1931.

Two distinct species of *Septoria* have been shown to cause different types of late blight of celery. One produces a large, well-defined spot in the centre of which small, scattered pycnidia are formed under suitable conditions of humidity. This type has been identified from the specimens of Briosi and Cavara and those of Chester as *S. apii* (Bri. et Cav.) Chester. The other species forms a small, indefinite spot surrounded by, and densely crowded with black pycnidia. This type has been identified with the species found by Dorogin in Russia and named *S. apii graveolentis* (*Mat. Mik. i Fitopat. Rossii*, i, p. 57, 1915) [cf. *R.A.M.*, i, p. 326; vi, p. 332]. Both forms have been found throughout the United States, the latter, however, being the more common and destructive. Both species have been shown to be serious parasites of celery leaves, but only the small spot type appears to infect the petioles.

OGILVIE (L.) & MULLIGAN (B. O.). **A leaf spot of Lettuce due to Pleospora herbarum.**—*Gard. Chron.*, lxxxix, 2298, p. 35, 1 fig., 1931.

The Stanstead Park, MacHattie's Giant, Winter White, and Lee's Immense lettuce varieties in several counties of the west of England were affected during 1930 by an apparently undescribed leaf spot caused by *Pleospora herbarum.* The dark brown conidia of the imperfect stage, *Macrosporium sarcinula* [*R.A.M.*, iv, p. 61; ix, p. 248], which are borne abundantly on old lesions, measure 20 to 36 by 16 to 25 μ (average 30 by 19 μ); and the brown, muriform, 7-septate ascospores of the perithecial stage obtained in culture, 39 by 18 μ. The brown spots produced by the fungus are roughly circular, sometimes angular or oblong, often with a dark brown edge or a number of concentric rings; the centres may fall out, giving a shot hole appearance. The outer leaves are the most severely affected. Spraying the leaves with a spore suspension of the fungus led to the development of the typical symptoms, and the organism was reisolated from diseased material.

KHOKHRYAKOFF (M. K.). О видовом названии грибка из рода **Cercospora** на **Cichorium intybus L.** [The specific name of a fungus of the genus *Cercospora* on *Cichorium intybus* L.]—*Morbi Plantarum*, Leningrad, xix, 1–2, pp. 88–90, 1930. [French summary.]

The author states that in 1928 he found on the lower living leaves of *Cichorium intybus* in a locality of North Caucasus a species of *Cercospora* closely agreeing with Woronichin's diagnosis of *C. cichorii-intybi* (Materials for the fungal flora of the Caucasus.

—*Leningrad Acad. of Sciences*, 1927). The fungus was also found to be identical with a specimen of Davis's *C. cichorii* from Wisconsin preserved at the A. A. Jaczewski Mycological Laboratory in Leningrad. In reproducing both Woronichin's and Davis's diagnoses, he points out that the only difference is that in the former the conidiophore tufts are described as hypophyllous, and in the latter as epiphyllous, while in his fungus they are amphigenous, which may serve to reconcile the apparent contradiction of the two descriptions. He considers, therefore, that both authors had the same organism which, by right of priority, should be known as *C. cichorii* Davis.

LE CLERG (E. L.). **The relation of leaf blight to sun scald of Honeydew Melons.**—*Phytopath.*, xxi, 1, pp. 97–98, 1 fig., 1931.

As a sequel to the complete desiccation of the foliage of honeydew melons by leaf blight (*Macrosporium cucumerinum*) in the Arkansas Valley of Colorado during the summer of 1929 [*R.A.M.*, vii, p. 307], dark spots, 1 to 5 in. in diameter, with a white to grey margin of necrotic tissue, appeared on the side of the fruit exposed to the sun's rays. No fungi or bacteria were found in the freshly wounded tissue, but later in the season various organisms gained entrance to the fruit which finally turned into a soft, spongy, water soaked mass. Ultra-violet light is known to be strong at the elevation of the affected region (3,500 to 4,000 ft.) during the afternoon, and probably these rays are directly responsible for the injury to the fruit. Since the occurrence of leaf blight appears to be a necessary preliminary to sun scald, the control of the former would in all probability prevent the development of the latter.

LAYTON (D. V.) & WILSON (J. J.). **Three new wilt-resistant varieties of Watermelons.**—Abs. in *Phytopath.*, xxi, 1, p. 114, 1931.

Three new watermelon varieties resistant to wilt (*Fusarium niveum*) [*R.A.M.*, ix, p. 428], viz., Pride of Muscatine (K–S4), Iowa King (Q 23), and Iowa Belle (Q 21), grown on 30 acres of heavily infested soil, produced 27,000 lb. per acre of marketable fruit in 1930. Iowa Belle showed less anthracnose (*Colletotrichum lagenarium*) [ibid., viii, p. 294] injury in field and greenhouse infection tests than either Pride of Muscatine or Iowa King.

JAGGER (I. C.) & SCOTT (G. W.). **Melons resistant to powdery mildew.**—Abs. in *Phytopath.*, xxi, 1, pp. 113–114, 1931.

Since its first appearance in the Imperial Valley, California, in 1925, powdery mildew of melons (*Erysiphe cichoracearum*) [*R.A.M.*, vi, p. 716] has caused heavy damage every year. In 1928 numerous plants were grown from mixed lots of seed from India which proved almost immune from powdery mildew but were commercially useless owing to their unpleasant flavour and poor shipping qualities. However, by crossing these resistant individuals with the leading commercial cantaloupes or muskmelons,

followed by back-crossing and repeated selection, a start has been made in the production of strains combining the desirable table qualities of American melons with the resistance of the Indian varieties. In crosses there is a Mendelian segregation of the mildew-resistance character which is at least partially dominant in heterozygous plants.

MÜLLER (K.). **Phänologie und Pflanzenschutz im Weinbau.** [Phenology and plant protection in viticulture.]—Reprinted from *Weinbau und Kellerwirtsch.*, ix, 23, 3 pp. 1930.

Notes are given on some observations made by the writer at the Baden Viticultural Institute, Freiburg i. Br., on the relations between phenological factors and the incidence of *Peronospora* [*Plasmopara viticola*] and insect pests of the vine.

It was shown by the author's experiments in 1922 that infection by the conidia of *P. viticola* is possible when the shoots are only 6 to 7 cm. long and the leaves 2 to 3 cm. in size [cf. *R.A.M.*, i, p. 411 ; viii, p. 483]. The maximum amount of infection occurs during the period of intensive growth (end of May to the middle of July), the development of the fungus being favoured by warm weather and frequent rain. There is an old viticultural rule to the effect that spraying should be commenced when the shoots are 15 to 20 cm. long. There is, however, no necessary connexion between shoot length and mildew infection, and a more reliable rule would be to give the first application when the largest leaves are 10 cm. in width.

The development of *P. viticola* is practically restricted to the temperature range from 13° to under 29° C. Infection occurs during the night on leaves thoroughly moistened by persistent rain (at least 10 mm.) for at least two days ; intermittent heavy showers, which permit the rapid drying of the leaves, will not produce the necessary conditions. The disease is most prevalent on damp soils overgrown with weeds, which intensify the atmospheric humidity and thus maintain the foliage in a susceptible state over lengthy periods. Attention is drawn to the author's 'Inkubations-kalender' established over 17 years ago as a guide to the time of application of preventive sprays, and to the value of these phenological data in connexion with the establishment of experimental stations for forecasting attacks of vine mildew [ibid., ix, p. 762 *et passim*].

MOREAU (L.) & VINET (E.). **Sur les traitements curatifs du mildiou.** [On the curative treatments of mildew.]—*Comptes rendus Acad. d'Agric. de France,* xvii, 1, pp. 52–56, 1931.

The writers tested the efficacy against vine mildew [*Plasmopara viticola*] of the yellow and orange helions prepared according to the instructions of Truffaut and Pastac [*R.A.M.*, x, p. 156]. The vines were sprayed on 5th and 11th July, but the helions were less effective than 2 per cent. alkaline Bordeaux mixture applied on the same dates. The latter treatment gave even better results when preceded (on 25th May, 4th and 20th June) by preliminary applications of Bordeaux mixture, the first two constituting the so-called 'guarantee treatments' [ibid., x, p. 358].

UPPAL (B. N.), CHEEMA (G. S.), & KAMAT (M. N.). **Powdery mildew of the Grape and its control in Bombay.**—*Bombay Dept. of Agric. Bull.* 163 of 1930, 30 pp., 7 pl., 4 graphs, 1931.

A summary is given of investigations on powdery mildew of grapes (*Uncinula necator*) carried out in the Bombay Deccan from 1926 to 1930, inclusive.

Temperature was found to be the most important factor in the development of the fungus, which can occur within a range of 50° to 100° F. Fairly rapid growth is made between 75° and 84°, the optimum being from 85° to 95°, a temperature range prevailing on over 70 per cent. of the days in October, November, January, and February, i.e., the fruiting season of the grape, in this region; *U. necator* is not killed by temperatures as high as 108° to 110°. The fungus can grow over a wide range of atmospheric humidity (40 to 95 per cent.). Its development is checked by the low humidities and high temperatures of the summer months, and regions where such conditions prevail for the greater part of the year, e.g., Sind, are generally free from mildew. The development of the disease is further adversely affected by precipitation, a fact that explains its relative mildness during the monsoon in spite of favourable conditions of humidity and temperature. Bright sunlight also retards the growth of *U. necator.*

The most effective control of grape mildew has been given by dusting with sulphur [*R.A.M.*, vii, p. 139; ix, p. 505]. Bordeaux mixture and D.F.P. dust (a proprietary copper preparation) proved unsatisfactory, the former staining the berries and the latter causing severe burning. For vines of average size the maximum quantity of dust required per acre for three applications varies from 75 to 85 lb., the time needed for the three applications being 18 to 22 hours and the total cost Rs. 8. 8. 0 [12*s.* 9*d.*]. The crank type of hand-dusters gave better results than the bellows, the Peerless Dust Gun being particularly useful. The fungicidal properties of pure sulphur of 100- and 200-mesh fineness were not impaired by the admixture of cement, lime, gypsum, talc, or China clay as fillers up to 20 per cent. of the weight of free sulphur in the mixture. This practice is likely to reduce the injury to the fruit caused by high grade sulphur dusts in hot weather.

PRADEL (C.). **Observations sur le court-noué.** [Observations on court-noué.]—*Prog. Agric. et Vitic.*, xcv, 2, pp. 40–41, 1931.

Two forms of court-noué [*R.A.M.*, ix, p. 578; x, p. 291] have long been present in an Algerian vineyard where Carignan, Cinsault, and Marastel vines growing in patches of siliceous sand containing very little limestone show characteristic symptoms, the affected patches increasing steadily in area, even after twenty years. The Petit-Bouschet, Alicante (Grenache), and Alicante-Bouschet varieties remained, however, quite healthy even when planted in places where diseased vines had grown; Alicante × 93–5 was also found suited to these places. This form of the disease, which did not induce chlorosis, is regarded as physiological and due to unsuitable soil. A second form was marked by chlorosis (sometimes shown only in thin yellow stripes) and by an irregular court-

noué, the vines not having the usual willow head appearance; this condition was definitely contagious, every vine planted where a diseased one had previously grown becoming affected. The physiological form described is regarded as corresponding in appearance with roncet [cf. ibid., vii, p. 556].

England and Wales: new or interesting phytopathological records for the year 1930.—*Internat. Bull. of Plant Protect.*, v, 2, pp. 22–23, 1931.

The official correspondent of the Ministry of Agriculture and Fisheries records, apparently for the first time in England and Wales, the occurrence during 1930 of *Bacterium medicaginis* var. *phaseolicola,* causing the so-called 'halo blight' of dwarf bean (*Phaseolus vulgaris*) [*R.A.M.*, ix, p. 695], and of *Oidium hortensiae* on hydrangea leaves [ibid., vii, p. 447 *et passim*]. The following fungi, though not new to the country, are believed to be fresh records for the hosts in question: *Corticium centrifugum*, responsible for decay following scab (*Venturia inaequalis*) on apples imported from Canada [ibid., x, p. 38]; and *Helicobasidium purpureum* in a sporulating condition on a partially rotted mangold root, in strikingly close association with its sterile form *Rhizoctonia crocorum* [cf. ibid., ix, p. 700].

BEAUMONT (A.) & HODSON (W. E. H.). **Seventh Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30, 1930.**—36 pp., 1931.

This report contains, *inter alia*, the following references of phytopathological interest. The few cases of blackleg of mangolds inspected were found to be due to *Pythium de Baryanum* [*R.A.M.*, ix, p. 623], the damage from which on this crop was generally slight. In North Cornwall, however, the same fungus nearly ruined a field of sugar beets. Seed disinfection experiments gave negative results.

Severe injury was caused to the polyanthus varieties of narcissus in Devon by leaf scorch (*Stagonospora curtisii*), which also attacked Horace, Ornatus, and Golden Spur in Cornwall. The foliage of Princeps, King Alfred, and M. J. Berkeley remained noticeably free from infection. White mould of narcissus (*Ramularia vallisumbrosae*) [see below, p. 462] was less serious. The disease appeared in the Scilly Isles early in March, in West Cornwall on 3rd April, and in the Tamar Valley on 10th April, after which it was checked by cool weather. Severe local infection was frequent on poorly drained beds. *Mystrosporium adustum* [see below, p. 462], which produces black, decayed areas on iris foliage and also attacks the bulbs, appeared in West Cornwall on 15th April and elsewhere in May. The disease was readily produced experimentally by inoculation with pure cultures. The bulbs should be lifted every year and replanted in fresh soil.

A destructive disease of broccoli [*Brassica oleracea* var. *botrytis*] plants saved for seed in West Cornwall was found to be due to *Bacillus carotovorus* [ibid., viii, p. 195], which usually develops

only after the plants are full grown and the heads formed. Infection occurred both in the open field and in a cold greenhouse, where the plants were protected from frost, to which the rot was first attributed. All varieties, including the best Roscoffs, are liable to attack, while cabbage has also been observed to succumb to the disease.

Phytophthora cactorum was isolated from the fruit tissues of strawberries that suddenly turned brown and shrivelled after a very heavy thunder rain on 31st, May in the Tamar Valley [ibid., x, p. 42]. This is stated to be the first record of *P. cactorum* on strawberries in England.

SZEMBEL (S. J.). Распространение главнейших болезней культурных растений в Астраханском округе в **1926–1929** годах. [Prevalence of the chief diseases of cultivated plants in the district of Astrakhan during the period 1926 to 1929.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 61–80, 1930. [German summary.]

In this report brief notes are given on the diseases of cultivated plants which were observed in the district of Astrakhan from 1926 to 1929 [cf. *R.A.M.*, vi, p. 714], among which the following may be mentioned. The so-called 'degeneration' diseases of potatoes are very prevalent over the whole area, but do relatively little damage owing to the frequent replacement of locally grown seed-tubers by fresh importations from regions higher up the Volga. The variety Epicure, which outside the region is considered to be highly resistant to virus diseases, proved to be very susceptible under local conditions, the reduction in yield being frequently as high as over 60 per cent. in the second year of cultivation in the region. On the other hand, the variety Imperator only gave 1 per cent. reduction in yield in the second year. In 1927 onions suffered from a heavy epidemic of mildew (*Peronospora schleideni*), which in many cases destroyed up to 100 per cent. of the crop. As the local meteorological conditions of the year were distinctly unfavourable for mildew, it is believed that the epidemic was chiefly due to the introduction of the organism with onion seed from a nursery heavily infected with it in the preceding year, since locally grown seed had been totally destroyed by floods in 1926. It is stated, however, that the transmission of the mildew by onion seed is not admitted in literature [but see ibid., ix, p. 426].

The following diseases are stated to be new records for the district of Astrakhan, namely, a red discoloration of wheat and rye ears caused by an undetermined bacterium, possibly related to that causing black chaff [*Bacterium translucens* var. *undulosum*: see below, p. 441]; *Bact.* [*Bacillus*] *carotovorus* on carrots; *B.* [*Bact.*] *malvacearum* and *Phyllosticta gossypina* [ibid., vii, p. 375] on cotton; *Fusarium reticulatum* [ibid., ix, p. 625] on cucurbits; *F. brassicae* on cabbage; two unidentified species of *Fusarium*, one (? *F. roseum*) [*Gibberella saubinetii*: ibid., viii, p. 264] on wheat grains, and the other on cucumber fruits; and rust (*Melampsora apocyni* Tranzsch.) and melanose (*Septoria littorea* Sacc.) on the kendir fibre plant (*Apocynum venetum*).

ATANASOFF (D.), DODOFF (D.), & KOVAČEVSKI (I. C.). Нови паразитни гжби за България. (II Приносъ). [Parasitic fungi new to Bulgaria. (Second contribution).]—*Bull. Soc. Bot. de Bulgarie*, Sofia, iv, pp. 36–43, 1931. [English summary.]

Among the sixteen species of fungi included in this further list of parasitic micro-organisms which are stated to be new records for Bulgaria [*R.A.M.*, ix, p. 203] the following may be mentioned. *Ustilago panici-glauci* was found in 1929 on *Panicum glaucum*; all the flowers on infected plants were destroyed. The chlamydospores of the fungus are dark brown, oval, ellipsoidal or ovoid, with a rugose wall, and measure 11 by 7 μ. *Fusarium nivale* did considerable damage to wheat seedlings in the spring of 1930 in one locality; the perfect form (*Calonectria graminicola*) was not found. *Sclerotium oryzae* was recorded in 1927 on rice [ibid., x, p. 269].

A list is appended of 26 species of fungi recorded on hosts on which they had not been previously known to occur in Bulgaria.

SAMUEL (G.). **Summary of plant disease records in South Australia for the two years ending June 30th, 1930.**—*Journ. Dept. Agric. S. Australia*, xxxiv, p. 746, 1931.

During the period under review downy mildew of peas (*Peronospora viciae*) and of lucerne (*P. trifoliorum*) were recorded for the first time in South Australia. Lucerne was affected by a wilt due to a *Sclerotinia*, and tomatoes by streak and by root rots associated chiefly with *Verticillium albo-atrum* and *Colletotrichum atramentarium*. Early blight of tomato leaves (*Macrosporium* [*Alternaria*] *solani*) and a leaf blight apparently caused by a *Pleospora* closely related to, if not identical with, *P. herbarum* [*R.A.M.*, x, p. 414] were occasionally found. Mosaic of turnips and pink-root of onions [*Phoma terrestris*: ibid., ix, p. 155] were reported from some localities. Silver scurf of potatoes (*Spondylocladium atrovirens*), downy mildew of lettuce (*Bremia lactucae*), leaf blight of carrot seedlings (*Macrosporium carotae*), a *Botrytis* neck rot of onions, and a bacterial spot of beans probably due to *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* were recorded for the first time, as was powdery mildew (*Sphaerotheca pannosa*) of apricot and peach fruits. Black rot (*Physalospora cydoniae*) caused severe limb cankers of apples in one orchard. Scaly bark or psorosis of citrus was recorded for the first time.

MITRA (M.). **Report of the Imperial Mycologist.**—*Scient. Repts. Agric. Res. Inst., Pusa, 1929–1930*, pp. 58–71, 1931.

A general survey of cultivators' plots of pigeon pea (*Cajanus indicus*) in the vicinity of Pusa showed that out of a total of 32,703 plants, 4,936 or 15·1 per cent. were affected by wilt (*Fusarium vasinfectum*) [*R.A.M.*, x, p. 399]; a wilt of the same host was also caused, though only to a slight extent, by *Rhizoctonia* [*Corticium*] *solani*, inoculations with which gave about 80 per cent. positive results.

A shoot of Co. 316 sugar-cane was affected by downy mildew, caused by a species of *Sclerospora*; this is the first record of this disease in India, and only the conidial stage of the fungus was

found. The affected leaves had a mottled appearance resembling mosaic.

Further investigation of the disease of *Cinchona* seedlings at Munsong [ibid., x, p. 351] led to the isolation of a *Fusarium* from the roots and collar.

Potatoes were affected by wet rot, *Fusarium* rot [cf. ibid., viii, p. 486], and the form of rot due to *R. bataticola* [*Macrophomina phaseoli*: ibid., ix, p. 561]. Preliminary experiments showed that the last-named caused rot only between 33° and 38° C. Strains of *M. phaseoli* from gram [*Cicer arietinum*] and sesame [*Sesamum indicum*] were also able to infect potato.

Much rotting of stored maize cobs was caused by *Botryodiplodia theobromae* [cf. ibid., vii, p. 711]; in the early stages of the disease a few pycnidia formed on the kernel, but later these increased until the grain content was completely replaced by a black mass of spores.

Isolations made from root-rotted wheat and inoculations with the resulting fungi established the parasitism of a *Helminthosporium* (in addition to *H. sativum*) [ibid., ix, p. 432] different from any known species found on wheat or any other grass. Another species of *Helminthosporium* allied to *H. halodes* was isolated from diseased wheat from the Central Provinces, while a further species resembling *H. tritici-repentis* is also very common on the same host in Pusa. A close study of the Indian strain of *H. sacchari* from sugar-cane showed that the conidia in culture range from 30 by 11·5 to 112 by 18·5 μ (average 68·3 by 15·3 μ) and have 3 to 11 (average 6·9) septa. *H. sacchari* and its saltants cover a range of variation sufficiently wide to include, as far as spore size is concerned, all the forms of *Helminthosporium* that have been reported to produce eye spot of sugar-cane [ibid., viii, p. 134]. *H. turcicum* and *H. maydis* were found on sorghum in the Punjab. A strain of *H. maydis* is also present on ginger in Pusa. *H. nodulosum* and *H. leucostylum*, which are both seed-borne, were found on *Eleusine coracana*, the former fungus and *H. tetramera* on *E. aegyptiaca*, and an unnamed species of *Helminthosporium* on *E. indica*. Of these, *H. nodulosum* was the most virulent, attacking all parts of the plant at all the stages of its growth. Cross-inoculations showed that *H. nodulosum* can infect maize, *Setaria italica*, and *Panicum frumentaceum* but not wheat, oats, or barley.

Department of Botany.—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the fiscal year ending Nov. 30, 1930* (*Bull.* 271), pp. 241–248, 1931.

In the section of this report dealing with plant pathology W. L. Doran states that black root rot [*Thielavia basicola*: *R.A.M.*, ix, p. 629] was severe on tobacco even when the P_H value of the soil was reduced by an application of orthophosphoric acid from 5·9 to 5, indicating that other factors than soil acidity are involved.

Bodies resembling oospores were found in cucumbers affected with downy mildew, *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., viii, p. 426; ix, pp. 362, 437; x, p. 224], but attempts to germinate them or to infect cucumbers with them

were unsuccessful. Conidia produced during any dewy night did not survive after the dew had evaporated in the sun the following morning. In the absence of rain, infection must occur the same night as that in which the infecting conidia are produced, or the next morning.

E. F. Guba found that aluminium sulphate 1 in 100 to 1 in 500, inoculated sulphur, and monohydrated copper-lime dust (20–80) destroyed the viability of the spores of the eggplant wilt organism (*Verticillium albo-atrum*) [ibid., ix, pp. 359, 362]. When nutrient media were acidulated with sulphuric acid the growth of the fungus was completely inhibited when the P_H value reached 3·7; the rate of growth increased proportionately with an increase in the P_H value of the medium. The effect of field applications of various chemicals upon the control of the disease and the growth of the host was studied, but no results were obtained which might suggest that the acidification of infected soil would control wilt.

It was ascertained that the organism of carnation blight (*Alternaria dianthi*) [loc. cit.] does not survive a second winter in the field, a fact which indicates the importance of a two-year rotation. In general, the Matchless and related broad-leaved types were found to be very susceptible. In field tests with various dusts and sprays sal soda Bordeaux [Burgundy mixture] gave the best results against this disease, but no satisfactory control was obtained with any of the materials.

Forty-ninth Annual Report of the Ohio Experiment Station for 1929–1930.—*Ohio Agric. Exper. Stat. Bull.* 470, 269 pp., 39 figs., 3 diags., 17 graphs, 5 maps, 1931.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, ix, p. 508], contains, among others, the following items of phytopathological interest (pp. 57–78).

Tests were conducted over a period of two years and with 14 different varieties of asters to ascertain whether it was possible to control the seed-borne wilt organism [*Fusarium conglutinans* var. *callistephi*: ibid., ix, pp. 510, 546] by seed disinfection; the results obtained showed that immersion for ten minutes in mercuric chloride solution (1 in 1,000) and soaking for one hour in 0·25 per cent. semesan gave, respectively, 38·5 and 64·2 per cent. good plants, as compared with 44·9 per cent. in the untreated controls.

The treatment of gladiolus corms against scab (*Bacterium marginatum*) [ibid., ix, p. 509] with Bayer-semesan compound 694 gave better results than those obtained from the standard mercuric chloride treatment, and did not interfere with flower or corm production. Corms given the former treatment had 3·5 and the latter 5·7 per cent. severe scab, as compared with 26·6 in the untreated controls; calomel was also highly effective (only 1·5 per cent. severe scab) but expensive.

In April, 1930, tomatoes in greenhouses in the vicinity of Cleveland were severely affected by wilt (*Verticillium albo-atrum*) [ibid., ix, p. 546], which was present in 14 out of 22 houses.

Cenangium abietis [ibid., x, p. 280] in three localities in Ohio caused severe twig and branch cankers on old pines, and on young

ones trunk cankers also. White pine [*Pinus strobus*] when planted for ornamental purposes under unfavourable conditions sometimes sustains considerable damage from this disease.

Evidence was obtained that it is possible to maintain black raspberry [*Rubus occidentalis*] plantings on an extensive scale almost free from virus diseases by properly executed isolation, inspection, and roguing. It is unsafe to plant red [*R. idaeus*] or purple [*R. neglectus*] varieties near black ones, as they usually have masked virus troubles very injurious to the black varieties.

SACKETT (W. G.). **Report of Bacteriologist.**—*Forty-third Ann. Rept. Colorado Agric. Exper. Stat. for the period from December 1, 1929, to June 30, 1930*, pp. 16–19, 1930. [Received May, 1931.]

In connexion with the varietal tests proceeding in three counties on reaction to wilt of lucerne [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 110], it is stated than an outstanding feature is the extreme susceptibility to mildew [*Peronospora trifoliorum*] of the Common strain, the yellow foliage of which is conspicuous at a distance.

The most serious disease of beans [*Phaseolus vulgaris*] in Colorado is bacterial blight [*Bacterium phaseoli*: ibid., x, p. 6], tests for resistance to which are in progress with six promising varieties at Rocky Ford.

SANDSTEN (E. P.). **Report of the Horticulturist.**—*Forty-third Ann. Rept. Colorado Agric. Exper. Stat. for the period from December 1, 1929, to June 30, 1930*, pp. 33–35, 1930. [Received May, 1931.]

Satisfactory results have been obtained in the development of tipburn-resistant varieties of head lettuce [*R.A.M.*, ix, p. 224] by crossing the common New York variety with the small-headed, purple-leaved Mignonette.

Work is also in progress in the selection of strawberry varieties showing resistance to root yellows, a disease that is becoming very prevalent in Northern Colorado and spreading to other sections.

OCFEMIA (G. O.). **Notes on some economic plant diseases new in the Philippine Islands: II.**—*Philipp. Agric.*, xix, 9, pp. 581–589, 3 figs., 1931.

The following diseases of plants are newly recorded from the Philippine Islands since the publication of the writer's previous list [*R.A.M.*, iv, p. 182]. About 5 per cent. of the rotting of tomatoes in the Los Baños district has been shown to be due to anthracnose, the causal organism of which is believed to be identical with *Colletotrichum phomoides* [ibid., x, p. 262]. The dark-coloured acervuli measure 98·8 to 165 μ in diameter (average 136 μ), the dark, thick-walled, septate setae 61 to 110 μ in length, the slender, thin-walled conidiophores 20·6 to 38·8 μ in length (average 26·7 μ), and the straight to crescent-shaped, tapering, unicellular, hyaline conidia 18·9 to 28·4 by 3·4 to 4·7 μ. The fungus produces circular, sunken, soft, watery lesions on the skin of the fruit. In cross-inoculation tests the fungus infected eggplants, *Averrhoa*

bilimbi, pepper (*Capsicum annuum*), on which it was particularly virulent, and mango.

Anthracnose of guava (*Psidium guava*) is provisionally referred to *Glomerella psidii* [ibid., vi, p. 716], and is characterized by circular, rose-tinged to dark-coloured acervuli, 84·5 to 574 μ in diameter (average 208·3 μ); filiform, thin-walled conidiophores averaging 14·9 μ in length; hyaline, obovate conidia, 13·6 to 20 by 3·7 to 3·8 μ (average 16·4 by 4·7 μ); globular to piriform, rostrate perithecia, 54·1 to 169 by 47·3 to 135·2 μ (average 106·8 by 88·3 μ); clavate asci, 50·7 to 84·5 by 11·4 to 15·6 μ (average 57·6 by 13·8 μ); and ovoid to oblong, curved, tapering ascospores, 12·2 to 20·7 by 4·1 to 5·8 μ. The fungus produces angular, rusty-brown spots, 2 to 5 mm. in diameter, on the leaves, and in rainy seasons causes a dark brown, dry blight of the shoots.

Ergot of sugar-cane, caused by a species of *Claviceps*, probably *C. purpurea*, was found on seedlings of the C.A.C. 87 and P.B. 236 varieties in January, 1930.

About 90 per cent. of the plants in a field of Yellow Flint maize were affected by a leaf gall disease, which may be detected in the early stages by the presence of shiny areas on the upper surface, and later by the curling of the margins of the middle portion of the leaves. Galls measuring 1 to 3 mm. by $\frac{1}{3}$ to $\frac{1}{2}$ mm. are formed on the main veins and coalesce until they sometimes extend from the base to the tip of the leaf, while the leaf sheaths may also be involved. Seriously infected plants are much stunted and with pale green leaves. The cause of the disease is unknown, but it somewhat resembles the Fiji disease of sugar-cane [ibid., x, p. 58], which was present in some adjacent plots.

Mr. T. Petch identified a fungus killing many aphids (*Pentalonia nigronervosa*) concerned in the transmission of bunchy top of abacá [*Musa textilis*: ibid., ix, p. 785] as a new species of *Cephalosporium*. He further identified the organism parasitizing the white grubs (*Leucopholis irrorata*) that attack the underground parts of sugar-cane as *Cordyceps podocreoides* v. Höhn.

Soru (Eugénie). **Le potentiel d'oxydo-réduction du tissu sain de la plante (Pelargonium zonale) et de la tumeur cancéreuse.** [The potential of oxido-reduction of the healthy tissue of the plant (*Pelargonium zonale*) and of the cancerous tissue.]—*Comptes rendus Soc. de Biol.*, cvi, 5, pp. 415–416, 1 graph, 1931.

Particulars are given of the writer's electrometric determinations at Bucharest of the potentials of oxido-reduction in the tumours occurring in *Pelargonium zonale* inoculated with *Bacillus* [*Bacterium*] *tumefaciens* as compared with healthy tissues of the same plant [*R.A.M.*, ix, p. 162]. In the healthy tissue the potential rose steadily till it attained a maximum of 90 millivolts E_H (electrode of hydrogen) in about 30 minutes. In the case of the tumour, the potential first rose for a short time, then sank, and finally increased again up to 140 millivolts in about 40 minutes. It is evident that the oxido-reducing power capacity of the healthy tissue exceeds that of the tumours, i.e., that the latter contain a larger supply of oxygen than the former [cf. ibid., vi, p. 602].

Studies in cereal diseases. V. Control methods for diseases of cereal, forage, and fibre crops prepared by the Dominion Laboratories of Plant Pathology at Winnipeg, Saskatoon, and Edmonton.—*Canada Dept. of Agric. Pamphlet* 123, 15 pp., 1930.

Directions are given in popular terms for the control of the chief fungous, bacterial, and physiological diseases of wheat, oats, barley, rye, maize, millets, flax, sunflower, lucerne, and clovers in Canada.

GREANEY (F. J.). **Sulphur dusting for the prevention of a bacterial disease of Wheat called black chaff.**—*Scient. Agric.*, xi, 5, pp. 274–280, 3 figs., 1931.

In giving a brief account of experiments conducted in Western Canada for the primary purpose of studying the efficacy of sulphur dusting in the control of wheat leaf rust (*Puccinia triticina*) [cf. *R.A.M.*, ix, p. 440], the author states that the results showed that dusting at frequent intervals with kolodust effectively prevented the development and spread of a disease externally identical with black chaff (*Bacterium translucens* var. *undulosum*) [ibid., ix, pp. 167, 364], although the causal organism has not yet been positively identified. The wheat tested was a H–44–24 × Marquis hybrid, known to be susceptible to black chaff, and the increased yield and better quality of the grain in the dusted plots as compared with the controls are attributed in part to the control of black chaff, in the absence of significant amounts of leaf and stem rusts. The experiment also indicated that under favourable conditions for its development, the black chaff disease spreads from plant to plant in the field.

PIESCHEL (E.). **Erfahrungen über Einsporimpfungen mit Getreiderostpilzen.** [Experiments on monospore inoculations with cereal rust fungi.]—*Phytopath. Zeitschr.*, iii, 1, pp. 89–100, 1931.

Full details are given of the writer's infection experiments at Gliesmarode, Brunswick, with monospore inoculations of the cereal rusts, on the upper surface of the leaves of plants kept under bell jars.

The resulting uredosori of *Puccinia triticina* on wheat and *P. simplex* [*P. anomala*: *R.A.M.*, x, pp. 88, 230] on barley are round, sharply delimited, mostly single, and surrounded on susceptible varieties by a narrow, pale, somewhat elongated halo. In *P. dispersa* [*P. secalina*: ibid., viii, p. 555] on rye the pustules are also surrounded by a halo, but they develop on both sides of the leaf. A similar mode of development was observed in the case of crown rust of oats (*P. coronifera*) [*P. lolii*: ibid., x, p. 236], the pustules of which are encircled by an orange-red halo. *P. graminis* on wheat produces several uredosori, principally on the under side of the leaf, as large, convergent, elongated pustules surrounded by an extensive halo. *P. glumarum* on wheat differs from the other cereal rusts in its profuse mycelial development and numerous minute pustules, over 100 of which may result from one monospore inoculation.

The highest number of successful inoculations was obtained with *P. triticina* on Roter Schlanstedt summer wheat (22 per cent.) and the resistant Halland (26 per cent.). Infection by *P. secalina* was also fairly readily induced on Petkus rye. On the other hand, great difficulty was experienced in obtaining infection with *P. glumarum*, only 7 per cent. of the 155 inoculations with which were successful. The average percentage of positive results with *P. lolii* was 9 [ibid., ix, p. 770]. *P. anomala* produced over three times as much infection on barley plants kept at 15° to 20·5° C. as on those held at lower temperatures; at 20° to 23° no infection occurred. In the case of *P. graminis* the results of inoculation experiments were almost entirely negative, only 4 out of 120 being successful [ibid., vii, p. 432].

Most of the inoculations with groups of spores of *P. triticina*, *P. secalina*, and *P. anomala* were successful, resulting in the formation of a single pustule exactly resembling those of monospore inoculations, and showing that a pustule may arise as a composite product of several mycelia.

IMMER (F. R.) & AUSEMUS (E. R.). **A statistical study of Wheat and Oat strains grown in rod-row trials.**—*Journ. Amer. Soc. Agron.*, xxiii, 2, pp. 118–131, 1931.

A statistical study [the methods of which are explained and the results fully discussed and tabulated] on wheat and oat strains grown in rod-row trials in different localities of Minnesota showed that stem and leaf rust [*Puccinia graminis* and *P. triticina*] reaction was negatively correlated with yield in hard red spring wheat in most of the comparisons made [*R.A.M.*, vii, p. 79]. Crown rust [*P. lolii*] infection was found to be negatively correlated with yield in oats [ibid., viii, p. 168]. The reaction to stem and leaf rust in wheat and to crown rust in oats was quite constant from year to year and from station to station. Significant correlations were obtained at the different stations between plumpness of grain, disease reaction, and date of heading.

Cereal smuts and their control.—*Min. of Agric. and Fish. Bull.* 24, 16 pp., 4 pl., 1930.

This is a brief and popular account of the symptoms, biology, and control of the cereal smuts occurring in Great Britain, namely: bunt or stinking smut (*Tilletia caries*, rarely *T. foetens*) and loose smut (*Ustilago tritici*) of wheat, covered and loose smuts of barley (*U. hordei* and *U. nuda*, respectively), and covered and loose smuts of oats (*U. kolleri* and *U. avenae*). A brief indication is also given of the economic importance of these diseases.

ABRAMOFF (I. N.). **Изучение головни хлебов в условиях Приморья в 1929 году.** [Investigation of cereal smuts under Littoral District conditions in 1929.]—*Дальне-Вост. Ст. Защ. Растений от Вредителей* [*Far-Eastern Plant Prot. Stat.*], Khabarovsk, *Bull.* 3, 26 pp., 1930.

This is an account of experiments from 1926 to 1929 at the Far-Eastern Plant Protection Station, Khabarovsk, on the control by seed treatment of wheat bunt (*Tilletia tritici*, very rarely *T. levis*)

[*T. caries* and *T. foetens*, respectively] and loose smut (*Ustilago tritici*), and oat smut [? *U. avenae*] in the Pacific littoral region, and also to determine the bearing of the date of sowing on the incidence and severity of these diseases. In the Russian Far East the wheat crop consists almost exclusively of spring varieties, and in 1926, when the sowing experiments were made, the severity of bunt progressively decreased from the earliest to the latest sowings, this effect being attributed to the low temperature of the soil at the earlier dates. The only exception was in the plot sown second at a time when the soil was saturated with water, in which the incidence of bunt was considerably reduced, this being probably due to the waterlogging of the soil which inhibited the development of the fungus. The incidence and severity of loose smut of wheat were found to bear no relation to the date of sowing, while oat smut was most severe in the plots sown at dates intermediate between the earliest and the latest. Incidentally it was found that the severity of stripe rust [*Puccinia glumarum*] was greatest in the later sown wheat plots.

Among the fungicidal dusts for seed treatment tested, very good control of bunt was obtained with copper carbonate (even with only 1·5 gm. per kg. of seed), Paris green, calcium and sodium arsenates, abavit B, and agfa, while uspulun and dehydrated copper sulphate only gave partial control. None of the dusts, however, proved effective against loose smut of wheat and the oat smut. Among liquid fungicides, formalin at concentrations of 1 in 400 and 1 in 500 reduced bunt to zero, and excellent results were also obtained with formalin in the form of tablets supplied by the German firm Schöring; the tablets were easily soluble in hot water after breaking up, and were effective against bunt at concentrations of 0·13 and 0·20 per cent. by weight of their dry substance. All the German liquid proprietary preparations tested, with the exception of tillantin B, also gave good control of bunt, but none was successful against loose smut. Steeping wheat seed for 5 minutes in 0·5 or 1 per cent. copper sulphate solution gave only partial control of bunt. In the case of oat smut only formalin gave satisfactory results.

Applications to the soil of mineral fertilizers, especially of superphosphate and potassium nitrate, appeared to reduce somewhat the incidence and intensity of bunt, but had no apparent effect on loose smut of wheat. All local wheats (almost all of them either *erythrospermum* or *ferrugineum*) are highly susceptible to bunt, and hard wheats also show a relatively high susceptibility under the local conditions; Persian wheat (*Triticum persicum* var. *stramineum*), on the other hand, was highly resistant, and all the bunted ears in this variety only showed partial infection (one or two diseased grains in the ear).

MUNERATI (O.). **Compétition entre Ustilago tritici et Tilletia tritici chez une même plante de Blé.** [Competition between *Ustilago tritici* and *Tilletia tritici* in the same Wheat plant.] —*Comptes rendus Acad. des Sciences*, cxcii, 5, pp. 296–297, 1931.

In this brief note the author states that experiments from 1925

to 1929 with the Gentile Rosso variety of wheat, which is highly susceptible both to bunt (*Tilletia tritici*) [*T. caries*] and to loose smut (*Ustilago tritici*), showed that in plants raised from seed-grains simultaneously infected with both organisms the first to appear externally was *U. tritici*, owing to the more rapid differentiation of this parasite in the wheat ear. In such plants the number of bunted ears is always distinctly lower than is normally the case in plants attacked by *T. caries* alone. The competing parasites are frequently localized in different spikelets, but in very rare cases both may occur in the same one, when the activity of *U. tritici* is restricted to the glumes which are disorganized, while the interior of the grains only contains *T. caries*. In the majority of the plants attacked by both fungi entirely normal ears are also to be found among the diseased ones.

HANNA (W. F.) & POPP (W.). **Bunt of Wheat in Western Canada.** —*Scient. Agric.*, xi, 4, pp. 200–207, 1 graph, 2 maps, 1930.

The authors state that an analysis of records of smutty wheats originating from Western Canada from 1919 to 1929, inclusive, showed that the incidence of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] is steadily on the increase, especially in Manitoba, where it may be attributed, in part at least, to the high proportion of durum wheat grown [cf. *R.A.M.*, ix, p. 445]. An indirect confirmation of this may be found in the fact that while the general percentage of West Canadian wheats graded as smutty was 1·07 in 1929 (as against an average percentage of 0·3 over the whole period of ten years), 16·48 per cent. of all the cars of durum wheats inspected were found to be smutty in that year. The total reduction in the market value of the 1929 wheat crop due to bunt is estimated at approximately $400,000, a figure which would probably be doubled if the losses caused by the disease in the field were taken into account. The durum wheats are attacked almost exclusively by *T. caries*, and the hard red spring varieties by both species.

The facts disclosed by this investigation emphasize the necessity of careful disinfection of wheat seed-grain before sowing.

DILLON WESTON (W. A. R.). **Virulency of Tilletia caries on Wheat varieties.**—*Nature*, cxxvii, 3204, pp. 483–484, 1931.

During the past seven years the writer has found no wheat variety consistently immune from, or markedly resistant to, bunt (*Tilletia caries*) [*R.A.M.*, viii, p. 436]. The traces of bunt frequently detected on so-called resistant varieties are believed to be an indication of susceptibility to a particular physiologic form in the population of the fungus.

The existence of physiologic forms of *T. caries* is shown by the following example. In England the Martin variety appears to be resistant to bunt produced on Little Joss wheat, the incidence of infection in two tests during the last six years being only 0·5 and 0·6 per cent., respectively. However, when a sample of this wheat from the Cambridge plots was grown in Denmark and contaminated with indigenous bunt spores from a local variety, it showed 27 per cent. infection. Martin wheat, contaminated with

bunt spores from White Odessa grown at Cambridge, developed 54 per cent. of bunted ears; this White Odessa bunt had grown previously on Little Joss and the spores are believed to have originated from the inoculum obtained from Little Joss in 1923. It is possible, however, that the original seeds of these varieties, sown in 1923, bore a few bunt spores other than those with which they were artificially contaminated—physiological forms capable of flourishing in one environment but not in another. In this connexion attention is drawn to the risks of forwarding collections of bunt from one country to another for the purpose of determining their relative virulence to different varieties of wheat. Although no varieties appear to be universally immune, some may well be moderately resistant to certain physiologic forms of bunt in particular localities, and these are jeopardized by the introduction of foreign physiologic forms.

ARNAUD (G.) & GAUDINEAU (Mlle M.). **La carie du Blé.** [Bunt of Wheat.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 2, pp. 37–40, 1 graph, 1931.

The results here reported of experiments in France in the control of bunt [*Tilletia caries* and *T. foetens*] on the susceptible Bon Fermier wheat by seed treatment with numerous dust and liquid fungicides have already been noticed from another source [*R.A.M.*, x, p. 303].

FRIEDRICHS (G.). **Die Kurznassbeizung in Beizapparaten für unterbrochenen Betrieb.** [The short disinfection process in steeping apparatus for discontinuous work.]—*Fortschr. der Landw.*, vi, 4, pp. 113–117, 1931.

As a result of his trials in 1929 with various apparatus for the discontinuous disinfection of cereal seed-grain (Globus, Ideal, Lothrä, Puk, and Primus), the writer concludes that such machines, contrary to the general opinion, are not adapted for the germisan short disinfection process [*R.A.M.*, ix, p. 665] without certain technical modifications. The Kurzbeizer Primus B II (G. Drescher, Halle, a.d.S.) proved very satisfactory for this method of seed treatment. The efficacy of the various apparatus for the disinfection of wheat seed-grain artificially inoculated with bunt [*Tilletia caries* and *T. foetens*] spores was tested by removing samples of the seed-grain after 3 and 4 minutes' treatment and sowing it in plots for comparison with similar inoculated but untreated seed-grain.

VAN DE LAAR (J. H. J.). **Onderzoekingen over Ophiobolus graminis Sacc. en Ophiobolus herpotrichus (Fr.) Sacc. en over de door deze fungi veroorzaakte ziekten van Triticum vulgare Vill. en andere Gramineae.** [Investigations on *Ophiobolus graminis* Sacc. and *Ophiobolus herpotrichus* (Fr.) Sacc. and on the diseases of *Triticum vulgare* Vill. and other Gramineae caused by these fungi.]—Thesis, Wageningen Agricultural College (H. Veenman & Zonen, Wageningen), 160 pp., 10 pl., 2 graphs, 1931. [French summary.]

This is a comprehensive account of the writer's researches on

the foot rot of wheat and other cereals caused by *Ophiobolus graminis* and *O. herpotrichus* in Holland and elsewhere [*R.A.M.*, ix, p. 641], with some observations on the environmental factors influencing the development of infection.

The following organisms were isolated from affected wheat received from different parts of the Netherlands, where heavy damage has been caused by foot rot of recent years, especially in 1927 : *O. graminis*, characterized by yellowish, straight or curved asci with an average length (198 measurements) of $96.50 \pm 0.78\,\mu$, containing ascospores 72 to 118 μ long; *O. herpotrichus*, with asci measuring 150 to 190 by 9 to 10 μ, and yellow ascospores, 140 to 154 by 2 to 2·5 μ; *Leptosphaeria herpotrichoides* [ibid., x, p. 91], rarely occurring on wheat in Holland, where it is ordinarily confined to rye and wild grasses; *Wojnowicia graminis* [ibid., ix, pp. 586, 641], a weak parasite of wheat found for the first time in Holland in 1928 and characterized by black pycnidia containing 5- to 7-septate spores measuring 29.58 ± 0.07 by $3.47 \pm 0.02\,\mu$; *Dictyosporium opacum*, which produces superficial, dull black spots on the basal internodes of wheat plants affected by foot rot, and may be recognized by its conidia, consisting of a clump of five or six rows of brown cells divided by cross walls; *Tetraploa aristata* B. et Br. (isolated only once from wheat stubble from Groningen); *Torula* (? *herbarum*), characterized by greenish-brown, smooth, spherical, concatenate conidia, 6 μ in diameter; and *Fusarium culmorum* [ibid., x, p. 94].

O. graminis is stated to be much more widespread in Holland than *O. herpotrichus*, of which at least two physiologic forms were obtained in pure culture, one being markedly pathogenic to Wilhelmina wheat and Bocum barley, while the other caused no damage to either. The symptoms developing on wheat and barley seedlings inoculated with the virulent strain included marked stunting, bleaching and etiolation beginning at the leaf bases, and slight blackening (but no actual rotting) of the 'foot'. *O. graminis* produced on inoculated wheat a reddish-golden discoloration of the leaves, severe stunting, blackening of the bases, and dwarfing or complete absence of grains. On barley these symptoms were much less prominent. *O. graminis* is the primary agent of foot rot of cereals in Holland, although in the past the disease has usually been attributed to *O. herpotrichus*. Perithecia developed on the following plants inoculated with a pure culture of *O. graminis*: wheat, barley, *Triticum durum*, *T. dicoccum*, *T. compactum*, *Hordeum murinum*, *Bromus arvensis*, *B. mollis*, *B. secalinus*, and *Festuca elatior*.

In view of the fact that *O. graminis* does not develop on acid media [ibid., ix, p. 586], there is some possibility that the incidence of foot rot might be reduced by avoiding the use of lime as a fertilizer. The disease has repeatedly been observed to occur in the most acute form on wheat following barley. It was also found to be more prevalent on early sown winter wheat (24th October) than on that sown later (10th December). None of the wheat varieties commonly cultivated in Holland is altogether immune from foot rot; among the most susceptible winter wheats are Imperial IIa, Strube's Gen. von Stocken, Trifolium, Waard en

Groet, and Wilhelmina, while of the summer varieties Mansholt's van Hoek and Japhet are more resistant than Hybride de la Paix. A 21-page bibliography is appended.

HÖHNEL (F. v.). **Über die Stellung von Gibellina cerealis Pass.** [On the position of *Gibellina cerealis* Pass.]—*Mitt. Bot. Inst. Tech. Hochschule Wien*, vi, 3, pp. 110–112, 1929. [Received May, 1931.]

In this posthumous note the author states that the examination of the specimens of *Gibellina cerealis* [the cause of the white straw disease of wheat: *R.A.M.*, x, p. 92], No. 3669 in Rabenhorst-Winter, Fungi Europ., No. 4048 in Roumeguère, Fungi Gall., No. 179 in Briosi & Cavara, Funghi parass., and No. 509 in Krypt. exs. Mus. vindob., showed the fungus to be a *Valsaria* Ces. & de Not. with an innate, spreading, non-emergent stroma, or *Phaeosperma* Sacc. (non Nitschke, 1869). However, whereas the fungi referred to *Phaeosperma* in Syll. Fungorum, i, p. 750, 1882, occur only on wood, *Gibellina* grows on leaves. Since the name *Phaeosperma* was already used by Nitschke, these fungi might be referred to *Gibellina*, provided that the woody forms do not differ from the latter genus in such a way as to necessitate a separation. In the latter case a new genus would have to be established, for which the name *Valsarioxylon* is proposed.

G. cerealis is characterized by stromata extending through the whole leaf thickness, and composed of thin-walled, hyaline hyphae, 1 to 2 μ in thickness. These often penetrate the epidermis and reach the underlying leaf sheaths, between which they form a thick grey or whitish mass. The perithecia occur in great numbers in the white stroma. The white, greyish-brown, or pale perithecial wall measures 15 to 25 μ in thickness, and is composed of many layers of very much congested hyphae. Towards the apex the wall becomes thicker (up to 40 μ) and dark-coloured, merging into a beak measuring 200 to 300 μ in length by 140 μ in thickness, and showing a channel furnished with numerous periphyses, embedded in mucilage, extending to the ostiole. The beak ruptures the epidermis and extends for a varying distance, presenting a conical or cylindrical aspect. The paraphyses are numerous, filamentous, and adhering to one another. The pale reddish-brown spores are uniseptate and measure up to 40 by 9 μ.

Gibellina should be placed in the Melogrammeae between *Broomella* and *Valsaria*.

HENRY (A. W.). **The natural mycoflora of the soil in relation to the foot-rot problem of Wheat.**—*Canadian Journ. of Res.*, iv, 1, pp. 69–77, 2 pl., 1 graph, 1931.

This is a preliminary report of experiments made for the purpose of testing the influence of the normal soil mycoflora on the development and pathogenicity of the fungi responsible for foot and root rots of wheat in Canada, among which *Helminthosporium sativum* and *Fusarium graminearum* [*Gibberella saubinetii*] only were considered in the work, most attention being devoted to the first. The experiments (throughout which the black loam soil typical of

the Edmonton district of Alberta, Canada, was used) consisted in introducing the pathogens from pure cultures, together with cultures of the micro-organisms (bacteria, actinomycetes, and fungi) isolated from the soil into flasks of moist soil, and allowing them to develop on this substratum alone, without the addition of any extraneous material, for 24 days at room temperature. The flasks were then emptied at seed level into pots with sterilized soil; Marquis wheat seeds, previously sterilized by the modified hot-water method, were sown directly in the layer of inoculated soil, and covered with sterilized soil. As no attempt was made to study the effect of individual saprophytic organisms, only mixtures of each group or of all the groups together were used. In another series, various amounts of unsterilized soil, starting from a trace, were added, together with cultures of the parasites, to flasks of sterilized soil.

The results appear to indicate that the natural mycoflora of the soil investigated has a pronounced controlling effect on the development of *H. sativum* and *G. saubinetii* in the soil, the greatest activity being apparently displayed by the soil fungi, which included species belonging to the genera *Rhizopus*, *Penicillium*, and *Fusarium*, besides an undetermined species which only produced chlamydospores in culture. Additional experiments showed that individual members of the three groups of soil saprophytes vary in their inhibitive action on the parasites, the suppression of which in the soil appears to be correlated with a reduction in severity of their attack on wheat seedlings.

The investigation is considered to offer at least a partial explanation of the frequent failures to obtain successful infections in the field, where the inoculum is applied to the soil, and also of the difficulty usually experienced in the isolation of certain plant pathogens from field soils. It also tends to explain the agricultural value of the summer bare fallow system, under which the soil saprophytes no doubt have a considerable advantage over the pathogens in the competition for food supplies; where stubble is present on which the parasites are already established, the soil saprophytes probably are unable to overcome them as readily.

TAYLOR (J. W.) & ZEHNER (MARION G.). **Effect of depth of seeding on the occurrence of covered and loose smuts in winter Barley.**—*Journ. Amer. Soc. Agron.*, xxiii, 2, pp. 132–141, 1 fig., 2 diags., 1931.

In a four-year experiment at the Arlington Experiment Farm, Virginia [the results of which are fully discussed and tabulated], from 2·7 to 115 times as much covered smut (*Ustilago hordei*) was found in Tennessee Winter barley sown at a depth of 3 inches as in the same variety at ½ inch. Loose smut (*U. nuda*) was from 2·1 to 44·5 times more intensive in the deep than in the shallow sowings [*R.A.M.*, vi, p. 412]. In a two-year experiment with the Wisconsin Winter variety similar results were obtained, but Esaw and Beardless, which are resistant to the local covered smut, showed no significant difference in loose smut infection due to owing at varying depths.

CHURCHILL (B. R.). **Investigations with Oat varieties and diseases in the Upper Peninsula.**—*Michigan Agric. Exper. Stat. Special Bull.* 213, 15 pp., 4 figs., 1931.

Experiments conducted at the Upper Experiment Station, Chatham, Michigan, from 1919 to 1930, inclusive, showed that the Markton variety of oats was highly resistant to smuts [*Ustilago avenae* and *U. levis*: *R.A.M.*, viii, p. 298; x, p. 179], Wolverine and Iogold being less so, and Anthony highly susceptible. Seed treatment with formaldehyde or smuttox gave excellent control [ibid., ix, p. 299], ceresan gave fair control, and copper carbonate very little; it did not affect the yield of Wolverine or Iogold, though formaldehyde decreased the yield of Markton and smuttox and ceresan increased that of Anthony.

The early varieties Richland and Iogold were very resistant to stem rust [*Puccinia graminis*], whereas Silvermine, Markton, Wolverine, and Swedish Select were highly susceptible.

In localities in the Upper Peninsula of Michigan where stem rust or unfavourable autumn conditions prevail an early rust-resistant oat such as Iogold or Richland should be grown.

KOEHLER (B.) & HOLBERT (J. R.). **Control of Corn diseases in Illinois.**—*Illinois Agric. Exper. Stat. Circ.* 364, 27 pp., 2 col. pl., 17 figs., 1931.

Directions are given in popular terms for the control of some common diseases of maize in Illinois by cultural measures (including sanitation, crop rotation, soil management, and the development of disease-resistant strains), seed treatment, and the selection of clean seed by germination tests [*R.A.M.*, x, p. 180].

MELCHERS (L. E.). **Downy mildew of Sorghum and Maize in Egypt.**—*Phytopath.*, xxi, 2, pp. 239–240, 1931.

In June, 1928, the writer observed a downy mildew on sorghum and maize at the Giza (Cairo) agricultural experiment farm, this being the first record of its occurrence in Northern Africa, though it may have been present as early as 1926. All the infected plants were burnt, but later the disease appeared elsewhere on the farm on some sorghum varieties raised from seed brought by the writer from Kansas. These plants were also removed immediately. The source of infection is not definitely known, but circumstantial evidence indicates that the fungus on sorghum (identified by R. M. Nattrass and W. H. Weston as *Sclerospora graminicola* var. *andropogonis-sorghi*, the latter authority emphasizing the simularity of the Egyptian material to Kulkarni's Indian specimens) [*R.A.M.*, iii, p. 570, and next abstract] may have entered Egypt on packing materials from India. The maize material examined by Nattrass and the writer did not show any differences in conidial appearance or dimensions from that on sorghum, but cross-inoculations between the two hosts were not carried out. The warm, humid conditions generally prevailing in the Nile delta during the period from the latter part of June to September would favour the development of the mildew.

UPPAL (B. N.). **A new host of Sclerospora graminicola var. andropogonis-sorghi.**—*Internat. Bull. of Plant Protect.*, v, 2, p. 26, 1931.

Sclerospora graminicola var. *andropogonis-sorghi,* the cause of shredding of sorghum in the Bombay Presidency [*R.A.M.*, ix, p. 506, and preceding abstract], has been found to infect maize naturally. Artificial infection of the latter host was induced by placing the oospores of the fungus on seed in the soil. The biometrical dimensions of the organism collected from sorghum and maize were identical.

UPPAL (B. N.). **Infection of Setaria italica by Sclerospora graminicola on Green Foxtail and Everglade Millet.**—*Internat. Bull. of Plant Protect.*, v, 2, p. 26, 1931.

In cross-inoculation tests on the various hosts of *Sclerospora graminicola,* up to 70 per cent. infection of *Setaria italica* was secured by means of oospores of the fungus from *S. viridis* and *S. magna* [*R.A.M.*, x, p. 23].

CHEVALIER (A.). **Une maladie du Pénicillaire au Sénégal.** [A disease of Pearl Millet in Senegal.]—*Rev. de Bot. Appliquée,* xi, 113, pp. 49–50, 1931.

Owing to increasingly frequent attacks of a sort of smut (especially in wet years) the beardless variety of pearl millet (*Pennisetum typhoideum*) is becoming less widely cultivated in Senegal. *Balansia claviceps* and a *Neovossia,* possibly *N. barclayana,* were found together on one affected ear collected by the author in 1925.

SIRAG EL DIN (A.). **The diseases of Citrus.**—*Min. of Agric., Egypt, Mycol. Res. Div.* (*Plant Protect. Sect.*), *Leaflet* 12, 60 pp., 27 figs., 1931.

Popular notes (including some based on the work of H. R. Briton-Jones and T. Fahmy) are given on the symptoms, etiology, and control of a number of citrus diseases occurring in Egypt, of which the following are the most important. Root, trunk, and branch gummosis (*Phytophthora citrophthora*) [*R.A.M.*, x, p. 308] is serious in Lower and Middle Egypt, especially where citron (*Citrus medica*) stocks are used for grafting. Twig gum disease, which may assume a severe form, is attributed to *Fusarium solani.* Anthracnose or wither-tip (*Colletotrichum gloeosporioides*) [ibid., x, p. 182] is common and may be serious. Melanose (*Phomopsis citri*) is also common but of minor importance. Other diseases of obscure origin are also mentioned and illustrated. These include one termed blight, of which the symptoms are a wilting of the twigs near the top of the tree which may extend to the branches lower down and causes the leaves either to drop or to remain withered on the shoots. The disease appears to be associated with certain unsuitable soil conditions.

MARLOTH (R. M.). **The influence of hydrogen-ion concentration and of sodium bicarbonate and related substances on Penicillium italicum and P. digitatum.**—*Phytopath.*, xxi, 2, pp. 169–198, 6 graphs, 1931.

The two chief citrus fruit-destroying fungi in California are the blue and green moulds (*Penicillium italicum* and *P. digitatum*, respectively) [*R.A.M.*, vii, pp. 163, 316]. An examination by Dr. H. S. Fawcett of 500 boxes of stored oranges in four packing houses in 1927 showed that 95 per cent. of the decayed fruit were rotted by these fungi, of which *P. digitatum* occurred alone in 52 per cent., *P. italicum* in 11 per cent., and both together in 32 per cent. In the same year a grower at Rialto found that the treatment of oranges with sodium bicarbonate gave equally good control of these moulds with borax or a mixture of borax and boric acid [ibid., vii, p. 576; ix, p. 775]. The holders of the patent rights for borax having at the same time decided to enforce their claims to royalties for its use [but see next abstract], a change was made in most packing houses from borax to sodium bicarbonate. The present investigation was conducted to determine the exact mode of action of sodium bicarbonate on *P. digitatum* and *P. italicum*, experiments on the hydrogen-ion concentration relationships of which were also carried out.

By growing the fungi on a modified Duggar's solution, consisting of $(NH_4)_2SO_4$, 10 gm.; K_2HPO_4, 5 gm.; $MgSO_4{\cdot}7\,H_2O$, 1 gm.; $FeSO_4$, trace; cane sugar, 25 gm.; and 1 l. water, plus sterilized orange extract, in an apparatus allowing of the daily renewal of the medium under the mats, and by weighing the dried mats after eight days' growth, a fairly wide optimum range of hydrogen-ion concentration tolerance for growth was observed, viz., P_H 2·9 to 6·5 for *P. italicum* and P_H 3 to 6 for *P. digitatum*. No mat was produced by the former fungus if the initial P_H of the medium was below 2·1, the corresponding figure for the latter being 2·4. The upper limits for mat formation are tentatively placed at about P_H 7·9 and 7·8, respectively.

Sodium citrate exerted a marked inhibitory effect on the growth of *P. italicum* (owing to the action of the sodium ion) at a concentration of 20,000 p.p.m. of the sodium ion in the medium and on *P. digitatum* at 15,000 p.p.m. No such effect was produced by the potassium ion even at a strength of 35,000 p.p.m. The inhibitory effect on growth exerted both by sodium and potassium chloride at a concentration of 10,000 p.p.m. of the concentrations is due mainly to the chlorine ion. Sodium carbonate was found to be considerably more toxic to the ungerminated spores of both the moulds than sodium bicarbonate at the same concentration, but neither was very effective against *P. italicum*, and sodium borate was better than either against *P. digitatum*. Potassium carbonate and bicarbonate were slightly less toxic than the sodium salts. On germinating spores the results were in general similar.

It is believed that the bicarbonate ion as such is toxic to these fungi, for its solution gives a P_H value of $\pm 8{\cdot}4$, and that when the hydroxyl-ion concentration in a solution is large enough to give a P_H value of 10+, the toxic property of such a solution resides in the hydroxyl ion; the destruction of the protoplasm is effected

by the neutralization of the positively charged colloids therein or by a reversal of the charge on amphoteric proteins in the protoplasm. It is suggested that the prevention of decay by the commercial bicarbonate process is effected as follows. When spores of the moulds on the rind of the fruit are in the act of germination, a saturated solution of sodium bicarbonate formed from the thin film of salt left after treatment destroys the protoplast of the thin-walled germ-tube or of the spore at the spot where the wall is weakened for the emergence of the tube.

Supreme Court rules that Brogdex patent is invalid.—*California Citrograph*, xvi, 6, pp. 276, 279, 1931.

By a unanimous decision of the judges, the United States Supreme Court on 2nd March, 1931, held that the use of borax in the treatment of citrus fruit against moulds [*Penicillium italicum* and *P. digitatum*: see preceding abstract] does not infringe the patent held by the Brogdex company [*R.A.M.*, viii, p. 170]. The Court held that an orange treated with borax is not, as the Brogdex company pleaded, a manufactured article, and that there was no ground in fact for a patent; and further, a ruling was made that the Brogdex process lacked novelty, the substance of it having been disclosed by Simeon Bishop twenty years previously. The patent held by the Brogdex company in respect of this process was, therefore, declared void. This decision does not affect other patents held by the company for the use of borax in combination with materials other than boric acid.

Toro (R. A.). **Nuevas enfermedades de la Palma de Coco en Puerto Rico.** [New diseases of the Coco-nut Palm in Porto Rico.]—*Rev. Agric. Puerto Rico*, xxvi, 8, pp. 42–44, 6 figs., 1931.

Popular notes are given on some diseases of coco-nut palms not previously recorded from Porto Rico, viz., little leaf, wilt [*R.A.M.*, ix, p. 714], and stem rot, various forms of which have been observed. The more common type, occurring on palms in full bearing near San Germán, is characterized by a reddening of the stems accompanying the desiccation of the gummy exudate, and by a rotting of the underlying tissues, which emit a peculiar odour. In another form of the disturbance, observed only in the vicinity of Mayaguez, the stem develops longitudinal fissures which subsequently exude a black gum and present the appearance of having been painted with pitch. Palms affected by the latter type of stem rot survived much longer than those suffering from the red form. Nothing is known regarding the cause of either form.

Labrousse (F.). **La pourriture du cœur des Palmiers en France (Phytophthora palmivora Butler).** [Bud rot of Palms in France (*Phytophthora palmivora* Butler).]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 2, pp. 13–24, 2 figs., 1931.

In September, 1930, *Rhopalostylis baveri* and *Kentia belmoreana* palms in a glasshouse at Versailles became seriously affected by a condition marked chiefly by an arrested development of the young leaves of the terminal bud. In the latter species some of

the young leaves when about to separate out from the central bud became elongated and drooping. The leaflets failed to open, and were yellowish-green. The base of the petioles of the affected leaves showed brown, elongated necrotic spots, similar spots being present also sometimes on the blade of the still folded pinnae of the same leaves. The affected *Rhopalostylis* palms were 6 to 8 m. in height, whereas the *Kentia* plants were in pots and about 1·5 to 2 m. high.

In the parenchyma of areas near the lesions the author found a non-septate, intercellular mycelium averaging 5 μ in diameter with rounded, non-digitate haustoria.

In pure culture the organism formed sparse, ovoid, short-stalked sporangia with a terminal papilla. The sporangia averaged 50 to 51 by 35 to 40 μ and with a length : breadth ratio of 1·3 to 1·6. Abundant terminal or intercalary chlamydospores, with a rather thick yellowish or brownish membrane and measuring 39 to 42 μ in diameter, were also present, especially in old cultures. Spores that were definitely intermediate between chlamydospores and sporangia (indicating the close relationship between these types of fructification) were also seen, but in no instance were sexual organs developed in pure culture.

From the characters of the fungus, a typical *Phytophthora*, and the symptoms on the hosts the author considers that the disease is identical with the bud rot of palms common in the tropics and is caused by the same organism, *P. palmivora*.

Referring to the subdivisions in this species proposed by Gadd and adopted by Ashby [*R.A.M.*, viii, p. 526], the author states that when paired cultures were made between his strain of the fungus and strains of the 'cacao' group isolated from *Borassus* sp., *Cocos nucifera*, and cacao, as well as with two strains of the 'rubber' group, in the series made with the latter group sexual organs typical of *P. palmivora* developed after one week, though they were not observed in the other series. The author's strain is therefore regarded as belonging to the 'cacao' group. According to Ashby it closely resembles strains of *P. palmivora* from coco-nut and *B. flabellifer* studied by him from the West Indies.

It is thought that infection was probably introduced into the glasshouse on seed several years ago.

WALLACE (G. B.). **A parasitic disease of Coffee beans.**—*Trop. Agriculture*, viii, 1, pp. 14–17, 1931.

This is a fuller account of the disease of coffee beans in Tanganyika, a brief reference to which was made in a previous note [*R.A.M.*, ix, p. 715]. It has been now found to occur also in Toro (Uganda), and is believed to be probably present in most of the coffee-growing areas of East Africa. The causal organism has been definitely identified as *Nematospora coryli* [ibid., v, p. 390], and preliminary experiments have given conclusive evidence that it is carried by the coffee bug (*Antestia lineaticollis*), though other puncturing insects probably also serve as distributors of the disease. The only feasible control is the destruction of the insect carrier by means of sweetened arsenite of soda and the immediate removal of diseased coffee cherries as they appear. In indicating the wide host

range of *N. coryli*, the possibility is mentioned of coffee plants being infected from other hosts if the bugs feeding on the latter migrate to the coffee. In any case, leguminous cover crops, some of which are known hosts of the fungus, should be regarded with suspicion.

Some details are given of another disease which is common in coffee plantations in Northern Tanganyika, characterized by a very considerable amount of berry fall, most acute in the early part of the year and apparently developing at the end of the rainy season. The indications so far collected are that it is due to physiological causes. It is somewhat reminiscent of the 'jollu' or 'black bean' disease of coffee in South India [ibid., iv, pp. 166, 591]. The differences distinguishing this disease from the *Nematospora* infection are given in a table.

COSTANTIN (J.). **Influence de l'altitude en pathologie végétale.** [Influence of altitude in plant pathology.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, x, 111, pp. 851–860, 1930.

The author states that one of the main limiting factors to the cultivation of coffee in the Old World is rust (*Hemileia vastatrix*) [*R.A.M.*, ix, p. 451], the absence of which from the New World has greatly contributed to the latter's supremacy in the production and export of this commodity. Experience in Kenya and Tanganyika, however, is stated to have shown that the coffee plant is much more tolerant of the disease at higher than at lower altitudes, the explanation of this suggested by the author being that coffee is an essentially mountainous plant, the resistance of which to various diseases is considerably reduced by its cultivation at altitudes below 1,500 m. He also believes that the same may apply to the 'phloem necrosis' disease of coffee [ibid., x, p. 377], the etiology of which is still very obscure.

TAUBENHAUS (J. J.), EZEKIEL (W. N.), & LUSK (J. P.). **Preliminary studies on the effect of flooding on Phymatotrichum root-rot.**—*Amer. Journ. of Botany.*, xviii, 2, pp. 95–101, 1931.

Observations during the past twelve years in Texas have shown that cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, x, p. 380] is extremely uncommon in areas subject to periodical flooding, even in regions where the disease is prevalent. Root rot was introduced into a creek bottom in 1927 by the artificial inoculation of cotton plants, which succumbed to the disease. These plants were allowed to remain over winter, with the result that the disease reappeared on the cotton crop of the following year and spread considerably. The normal soil conditions, therefore, were evidently not unfavourable to the disease, the general absence of which on such lands would appear to be due to the state of the soil during or immediately after periods of inundation. In a laboratory test, strands of *P. omnivorum* on naturally-infected cotton roots were inactivated by submergence in saturated soil for more than three days, while in a parallel series, at the same temperature but stored in moist air, the fungus was still viable after a fortnight and capable of attacking normal cotton plants.

Three seasons' flooding experiments in the field, for periods of up to 120 days at a time, failed to produce significant changes in

the survival of root rot on cotton and cowpeas or to eliminate the roots of plants that serve as carriers of the disease, e.g., *Solanum elaeagnifolium*, from the soil. The survival of the fungus in these experiments may be explained either by the failure of the water to penetrate to a sufficient depth, or by the presence of sclerotia capable of withstanding long periods of immersion.

PAILLOT (A.). **Traité des maladies du Ver à soie.** [A treatise on silkworm diseases.]—Paris, G. Doin & Cie, 279+vi pp., 99 figs., 1930.

This comprehensive and copiously illustrated treatise on diseases of silkworms is divided into sections dealing: (1) with the normal anatomy, histology, and histophysiology of silkworms: (2) muscardine (*Beauveria bassiana*) [*R.A.M.*, viii, p. 443] and 'pébrine' (*Nosema bombycis*); (3) grasserie or jaundice, gattine (*Streptococcus bombycis*), and flacherie (*Bacillus bombycis*); and (4) dysentery of non-microbic origin.

From very numerous observations [which are fully described] the author concludes that there exists in the body of silkworms affected with 'grasserie' an ultramicroscopic virus which multiplies in the nucleus of certain cells and is there able to initiate the morbid processes which finally elaborate polyhedric bodies [cf. ibid., viii, p. 779] at the expense of the nuclear material. This organism the author places in an intermediate group between the bacteria and the protozoa which he names *Borrellina*, the organism itself being designated *B. bombycis*.

One of the most salient characteristics of ultramicroscopic viruses is their affinity for the living cell; it is usually towards young cells in process of mitosis that the biotropism of the ultraviruses is most actively shown. In the case of 'grasserie' the disease is always most prevalent just after the silkworms have moulted, the original infection having taken place at the time of the previous moult. This process is marked by an active multiplication of the cells of certain tissues; mitoses are particularly abundant in the hypodermis, the adipose tissue, and the blood, and these are the tissues for which the ultramicroscopic virus shows the strongest affinity.

A further characteristic of these diseases is the presence in the affected cells of intranuclear or intraprotoplasmic inclusions, the shape of which varies according to the organism causing their appearance; in 'grasserie' they are generally hexahedral. The organism that causes 'grasserie' retains its virulence in dried blood for a year; it is adsorbed energetically by the polyhedric bodies, and cannot be separated out by washing.

Both 'grasserie' and polyhedral diseases in general are considered by the author undoubtedly to belong to the ultramicroscopic group of viruses.

FILMER (J. F.). **'Lumpy or matted wool', or mycotic dermatitis in sheep.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., vii, 4, pp. 571–572, 1930.

This is a very brief account of mycotic dermatitis of sheep (*Actinomyces dermatonomus*) [*R.A.M.*, viii, p. 643; ix, pp. 309,

717], several cases of which have been reported from Western Australia of recent years. In one flock a condition was also observed, in which small granules of a yolk-like material were seen in the wool, and the sheep were noticed to have been rubbing. Examination in the laboratory did not allow of reaching any definite conclusion on the cause of this condition, but it is suggested that this may be an early stage of mycotic dermatitis.

ACTON (H. W.) & MCGUIRE (C.). **Actinomycotic lesions of the skin of the hands and feet, due to Actinomyces keratolytica, n. sp.**—*Indian Med. Gaz.*, lxvi, 2, pp. 65–70, 3 pl. (1 col.), 1931.

The clinical lesions known in Bengal as 'phata' (cracked heels), 'chaluni' (pitted soles), and certain types of 'haja' (deep mango toe) have all been found to be due to an actinomycotic fungus, which is also occasionally responsible for paronychia, onychomycosis, and keratolytic vesicular lesions of the hands and feet [*R.A.M.*, ix, p. 653]. The predisposing cause of this condition is constant contact with wet earth, particularly where the soil is contaminated with horse dung, in which the fungus is frequently present.

The causal organism was isolated on Norris's medium [the composition of which is indicated] (*Agric. Journ. India*, July, 1929) in 42 cases and reinoculated into man with positive results. It is characterized by slightly curved terminal spindles consisting of 2 to 3 segments; intercalary chlamydospores forming spore-like bodies along the hyphae, which measure about 0·8 μ in diameter; and rounded conidia, 1 to 1·3 μ in diameter, occurring singly or in clusters along or at the end of the hyphae. The fungus is considered to be a new species of *Actinomyces*, to which the name *A. keratolytica* is given. Brief notes are given on the therapeutic treatment of the conditions under discussion.

BROCQ-ROUSSEU [D.]. **Sur le développement du cryptocoque de la lymphangite épizootique.** [The development of the *Cryptococcus* of epizootic lymphangitis.]—*Bull. Acad. Vét. France*, iii, pp. 150–153, 1930. [Abs. in *Trop. Veterinary Bull.*, xviii, 4, p. 139, 1930.]

Discussing the classification of the *Cryptococcus* causing epizootic lymphangitis [of the horse: *R.A.M.*, vii, p. 325] the author states that he has never observed the organism to multiply by budding, and in his opinion any appearance to the contrary is due to two parasites of unequal size lying side by side. Pus freshly taken from the centre of an infected lymphatic is crowded with variously sized, rounded elements, the thickness of the capsules of which varies considerably. A fully developed *Cryptococcus* shows a small gap in the envelope at one pole, which represents a round or oval aperture. The author considers that Velu, who described the passage of motile particles through a rupture in the envelope, saw a corpuscle emerging through this aperture. If reproduction does not take place by budding it is suggested either that the

organism sends out motile zoospores which lose their motility and become encapsuled or that it behaves like a cyst and emits spores.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude botanique et biologique d'une nouvelle levure rose (Cryptococcus radiatus n. sp.).** [Botanical and biological study of a new pink yeast (*Cryptococcus radiatus* n. sp.).]—*Comptes rendus Soc. de Biol.*, cvi, 7, pp. 597–598, 1931.

Notes are given on the cultural, morphological, and biochemical characters of a fungus which was found to be responsible for an epidemic of loss of hair among the members of a religious community in Haut-Rhin (France). The organism made profuse growth at room temperature and at 27° C. on the usual media, forming spherical cells 2 to 3 μ in diameter, occurring singly or in chains of 3 to 6. The colonies are salmon-pink with radiations extending outwards towards the periphery on Sabouraud's medium in Petri dishes. Gelatine was not liquefied, and milk, serum, and white of egg were not coagulated. The fungus is considered to differ from *Cryptococcus corallinus*, recently studied by the writers [*R.A.M.*, x, p. 104], as well as from *C. salmoneus*, and is named *C. radiatus* n. sp.

NEGRONI (P.). **Cryptococcus spp. isolés de certaines épidermomycoses.** [*Cryptococcus* spp. isolated from certain epidermomycoses.]—*Comptes rendus Soc. de Biol.*, cvi, 5, pp. 389–390, 1931.

From certain types of intertrigo the writer has isolated a number of species of *Cryptococcus* with similar biological and cultural characters. The fungi develop well on Sabouraud's medium, solid beerwort, and carrot, forming whitish, creamy colonies, liquefying gelatine and fermenting glucose, maltose, and levulose. The optimum temperature for growth is 30° C., with a minimum and maximum at 13° and 45°, respectively. The organisms are characterized by a rudimentary mycelium composed of short, moniliform, septate hyphae, from which are budded spherical or oval, vacuolate elements 3 to 10 μ in diameter.

CATANEI (A.). **Altération pléomorphique d'une culture de Trichophyton acuminatum.** [Pleomorphic modification of a culture of *Trichophyton acuminatum*.]—*Comptes rendus Soc. de Biol.*, cvi, 5, pp. 343–344, 1931.

Subcultures of *Trichophyton acuminatum*, originally isolated from ringworm of the scalp [*R.A.M.*, ix, p. 653], were observed to undergo pleomorphic modifications consisting in the development of a downy, white mycelium which was sterile except that aleuria were still present. The furrows typical of the original culture were fewer, less deep, and sometimes altogether absent. These modifications were permanent. Guinea-pigs inoculated with the pleomorphic culture developed small lesions of a milder type and of shorter duration than those induced by the original strain;

retrocultures yielded colonies of the pleomorphic type without aleuria.

CATANEI (A.). **Remarques sur la valeur de la distinction spécifique des Trichophyton violaceum et glabrum.** [Remarks on the value of the specific distinction between *Trichophyton violaceum* and *glabrum*.]—*Comptes rendus Soc. de Biol.*, cvi, 2, pp. 80–81, 1931.

The inoculation into an Algerian monkey (*Macacus inuus*) of a culture of *Trichophyton violaceum*, which had ceased to produce pigment, and had thus become indistinguishable from *T. glabrum* [*R.A.M.*, x, p. 105], resulted in the development of a lesion of the same type of juvenile ringworm as that caused by the former fungus in its original state. Retrocultures yielded the normal purple pigment. This result, taken in conjunction with the various peculiarities characterizing the majority of the strains of *T. glabrum* isolated in Algeria, indicates that the differentiation between the two species is well founded.

AGOSTINI (ANGELA). **Glenosporella dermatitidis n. sp. causa di dermatomicosi umana.** [Human dermatomycosis caused by *Glenosporella dermatitidis* n. sp.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. iv, ii, pp. 93–101, 4 figs., 1930. [Latin summary.]

A brief morphological, cultural, and taxonomic account is given of a fungus which was isolated from a dermatomycotic lesion on the leg of a female adult in Messina [Sicily]. On Pollacci's medium it produced at first minute, white, rounded, cupuliform colonies which later merged into irregularly cerebriform, amber-coloured formations of a gelatinous consistency, the surface of which remained moist even in old and almost dried-up cultures. The mycelium consists of hyaline (amber-coloured in Raulin's liquid medium), branched, usually continuous hyphae from 2 to 4 μ in diameter, together with swollen or claviform, irregularly septate hyphae from 7 to 9 μ broad. The aleuria are mostly pedicellate but occasionally sessile, and may originate either from a hypha or an arthrospore; when pedicellate, they occur either singly on hyphae of varying length, or in racemes consisting of very irregular ramifications with intercalary arthrospores which may produce hyphae again bearing aleuria or arthrospores. The aleuria are hyaline, obovate when still attached to the mother hypha, globose when detached, provided with a thick wall, and measure 7 to 10 by 4 to 7 μ. The arthrospores are rounded, oblong or irregular, and from 4 to 15 μ in diameter (12 to 23 μ in Raulin's liquid medium). The optimum temperature for growth is 25° C., but slow development was still possible at 35°. Inoculation experiments showed that the fungus was not pathogenic to white mice.

The organism is considered to be a hitherto undescribed species of Nannizzi's genus *Glenosporella* (which includes species resembling *Glenospora*, but hyaline), and is named *G. dermatitidis*, a Latin diagnosis being given. A list is appended of the species of *Glenospora* so far known to be pathogenic to man.

MANTARRO (G.). **Epidermomicosi acromizzanti da Hemispora stellata.** [Achromic epidermomycoses due to *Hemispora stellata.*]—*Giorn. Ital. di Dermatol.*, lxxii, 1, pp. 131–143, 1931.

Notes are given on six cases of achromia in Italy caused by *Hemispora stellata* [*R.A.M.*, ix, p. 592], all in young people who had been exposed to the sun's rays during the summer months of the last three years. Attention is drawn to the occurrence of a similar epidemic in France associated with the presence of *Malassezia furfur* [ibid., x, p. 312].

NEGRONI (P.). **Nouvelle Mucédinacée parasite de l'homme.** [A new Mucedine parasitic on man.]—*Comptes rendus Soc. de Biol.*, cvi, 5, pp. 386–388, 1931.

From the cutaneous squamae and nail trimmings of patients suffering from epidermo- and onychomycosis in Buenos Aires the writer isolated a fungus forming dirty white, velvety colonies on various standard media. The organism is characterized by hyaline, septate hyphae, 3 to 4 μ in diameter; hyaline septate conidiophores, with terminal branches 40 to 65 μ in length; and two types of conidia, viz., non-septate, 5 to 8 by 3 to 5 μ and two- to three-septate, 40 by 6 μ, with curved extremities. The parasite was clearly discernible in the skin and nail material treated with hot potassium (40 per cent.) as well as in the cultures. Parasitism was apparently not proved. It was identified by Thom as a species of *Cephalosporium*.

BADAYEVA (Mme P. K.). О болезнях Льна в Сибири. (Предварительные данные). [Flax diseases in Siberia. (Preliminary data).]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 192–199, 1930. [German summary.]

The results of field observations and of the examination in 1929 of flax seed samples from various centres indicated that the most prevalent diseases of flax in Siberia are anthracnose caused by *Colletotrichum linicolum* [*C. lini*: *R.A.M.*, x, p. 31], wilt (*Fusarium lini*) [ibid., ix, p. 783], powdery mildew (*Erysiphe cichoracearum*) [ibid., ix, p. 689], and a leaf and stem spot caused by a species of *Alternaria* with olive-coloured spores. The damage done to the crop by these fungi is frequently very considerable. Another disease of fairly frequent occurrence is a swelling of the stem near the collar, resulting in a dwarfing and excessive branching of the plants and the breaking down of the stems, the cause of which has not yet been established.

McWHORTER (F. P.). **Further report on Rose mosaic in Oregon.** —*Plant Disease Reporter*, xv, 1, pp. 1–3, 1931. [Mimeographed.]

Further notes are given on the extension of rose mosaic in Oregon [*R.A.M.*, x, p. 190], two cases bearing on the source of infection being reported in detail. The particulars of the first case indicate an active spread of the disease under field-growing conditions, and also suggest two wild plants, viz., wild wood-rose (*Rosa gymnocarpa*) and thimble berry (*Rubus parviflorus*), as

hosts of mosaic. The symptoms on the wood-rose were typical of the mild form of mosaic occurring in the greenhouse, while those on thimble berry included blanching of the veins, leaf crenation, and other features of the rose disease. In 1930 some fifty Manetti plants raised from cuttings obtained from England showed marked indications of mosaic, which was not found on any other wild or cultivated plants in the neighbourhood. It is therefore reasonable to suppose that infection was introduced direct from England.

VOGLINO (P.). **Le macchie livide delle Rose (Coniothyrium fuckelii Sacc.).** [Livid spots on Rose bushes. (*Coniothyrium fuckelii* Sacc.).]—*La Difesa delle Piante*, vii, 6, pp. 1–4, 1930.

In 1926 and again in 1930 rose bushes weakened by insect attack showed livid grey spots on the branches due to infection by *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, ix, p. 722]. In the necrosed tissues the author found hyaline, cylindrical, septate hyphae, branched at right angles and averaging 3 μ but reaching 5 μ in diameter. The subepidermal, later erumpent, black, almost spheroidal pycnidia with a protruding ostiole measured 150 to 200 μ in diameter, and contained numerous hyaline, later fuliginous-olivaceous, almost spheroidal pycnospores, 2·25 by 2·5 μ, which germinated in rose decoction in a few hours at 12° to 18° C., and retained their germinative power for several months.

Artificial infections of healthy rose branches gave negative results, but inoculations of minute wounds made on the branches of a one-year-old wilting rose bush produced small, livid spots, indicating that the fungus is only semi-parasitic.

The principal hosts of *C. fuckelii* and those of some closely related species are listed.

HEMMI (T.) & KURATA (S.). **Studies on septorioses of plants. II. Septoria azaleae Voglino causing the brown-spot disease of the cultivated Azaleas in Japan.**—*Mem. Coll. Agric., Kyoto Imper. Univ.*, 13, pp. 1–22, 2 pl., 1931.

A comprehensive account is given of the writers' researches on the brown spot disease of cultivated azaleas (*Rhododendron ledifolium* and *R. indicum* var. *obtusum*) caused by *Septoria azaleae* [*R.A.M.*, viii, p. 649] near Kyoto, Japan.

The irregular brown spots appearing on the leaves of the plants in the early autumn are stated to present quite a different aspect from the patches characteristic of the disease in Europe. The latter form, however, has also occasionally been found on *R. indicum* var. *obtusum* at Kyoto. With the advent of cold weather infection becomes so severe as to cause the loss of many leaves, resulting in extreme weakness of the affected plants.

The morphological and cultural characters of the fungus are fully described. The best liquid and solid media were found to be, respectively, potato decoction and nutrient agar with peptone. The most vigorous growth was made between 16° and 28° C., with an optimum at 24°. Inoculation experiments on healthy *Rhododendron* leaves with conidial suspensions of *S. azaleae* gave positive results after a lengthy incubation period of two months.

NAKAMURA (H.). **Studies on septorioses of plants. III. On Septoria callistephi Gloyer pathogenic on the China Aster.** —*Mem. Coll. Agric., Kyoto Imper. Univ.*, 13, pp. 23–32, 1 pl., 2 diags., 1931.

Septoria callistephi, the causal organism of the leaf blight of China asters (*Callistephus chinensis*) [*R.A.M.*, vi, p. 618], is stated to be widespread and destructive in Japan, chiefly attacking the foliage but also developing occasionally on the petioles, calyces, and pedicels.

Good growth was made on both solid and liquid media in the writer's experiments, the optimum temperatures for mycelial development ranging from 20° to 28° C. The morphology and cultural characters of the fungus are described. A salmon-orange sector, the colour of which persisted throughout repeated subcultures, was occasionally produced on soy agar. The pigment of the coloured sector was found to be readily soluble in ether and alcohols.

Inoculation experiments with spore suspensions of *S. callistephi* from soy agar cultures gave positive results on aster seedlings, the incubation period being about one month.

PAPE (H.). **Krankheiten und Schädlinge an Pelargonien und ihre Bekämpfung.** [Diseases and pests of Pelargoniums and their control.]—*Blumen- und Pflanzenbau*, xlvi, 2, pp. 21–23, 4 figs., 1931.

Popular notes are given on the following diseases affecting pelargoniums in Germany, with directions for their control: blackleg (*Pythium de Baryanum*, sometimes in association with *Moniliopsis aderholdi*, *Botrytis cinerea*, and other organisms); leaf spots caused by *Bacterium erodii* [*R.A.M.*, vii, p. 18] and *Bact. pelargonii* [ibid., ii, p. 371]; leaf spot due to *Macrosporium pelargonii* (recently reported as the cause of injury in Austria); grey mould (*Botrytis cinerea*); crown gall (*Bact. tumefaciens*) [ibid., ix, p. 767]; and leaf curl [ibid., vii, p. 516]. Spraying with 2 per cent. Bordeaux mixture is recommended for the control of blackleg, in addition to various sanitary precautions, while 1 per cent. solbar is effective against grey mould. The bacterial leaf spots may be controlled by the use of copper-containing disinfectants, and spraying with erysit or lime-sulphur has proved valuable in the case of leaf curl.

GROVE (A.). **The diseases of Lilies.**—*Gard. Chron.*, lxxxix, 2302, p. 110, 3 figs. (1 on p. 113), 1931.

Explanatory notes are given on a series of photographs received from Dr. A. B. Stout, of the New York Botanical Garden, illustrating the effects of mosaic on *Lilium speciosum* and *L. auratum*, and of 'yellow flat' on *L. longiflorum* var. *giganteum* [*R.A.M.*, x, p. 247]. During the past few years the percentage of mosaic-diseased bulbs of *L. longiflorum* in importations from Japan to the United States appears to be increasing. According to a responsible grower, 25 per cent. of his imported bulbs produced diseased stems and leaves in 1930. One consignment of *L. longiflorum* var. *giganteum* received in the United States from Japan was

found to contain 90 per cent. yellow flat. The writer has been informed that the German Government now requires a certificate of freedom from disease with all consignments of lily bulbs from Japan.

McWhorter (F. P.). **Ramularia blight of Narcissus.**—*Plant Disease Reporter*, xv, 1, pp. 3–4, 1 map, 1931. [Mimeographed.]

The European *Ramularia* blight of narcissus (*R. vallisumbrosae*) [*R.A.M.*, v, p. 343, and above, p. 434] developed in a most destructive form during the spring of 1930 in Oregon, where infection is believed to have been present since 1928. The damage consists of defoliation and premature ripening of the bulbs. The disease is limited to an area (Tillamook) in which an average annual rainfall of over 100 in. is to be expected. Immediate steps were taken to disinfect all bulb material leaving this zone for other parts of Oregon. The most susceptible varieties were Golden Spur, Henry Irving, Emperor, and Empress, while King Alfred was practically immune. The spores of the fungus measure on an average 30 by 4·1 μ, the extreme length being 42 μ; Cavara gives the size as 14 to 44 by 4 μ. Sclerotium-like structures, presumably the primordia of pycnidia, develop in large numbers on dying leaves after conidial formation has ceased.

Green (D. E.). **Ink disease of Iris.**—*Gard. Chron.*, lxxxix, 2299, p. 55, 1 fig., 1931.

Bulbs of *Iris reticulata* affected by the 'ink disease' (*Mystrosporium adustum*) [cf. *R.A.M.*, iv, p. 62, and above, p. 434] may be recognized by the inky-black stains of variable size on the reticulated outer skins. In some cases almost the entire area of the skin is involved and infection gradually travels inwards to the bulb, on which lesions with raised margins and black centres develop and spread over a large part of the surface. The diseased bulbs shrink and harden externally. Treatment with formalin (two hours' immersion in a solution of 1 in 300) is effective in cases of slight infection, but severely attacked bulbs should be burnt. Replanting in fresh soil is advisable in order to avoid contact with fragments of diseased plants.

Nicolas (G.) & Aggéry (Mlle). **Un nouvel exemple du rôle important des bactéries en phytopathologie.** [A new instance of the important part played by bacteria in phytopathology.]—*Comptes rendus Acad. des Sciences*, cxcii, 8, pp. 502–504, 1931.

As a further instance of the important part ascribed by them to bacteria in the causation of plant diseases [cf. *R.A.M.*, x, p. 387], the authors briefly describe the diseased condition of a few *Fatsia japonica* shrubs in the Botanic Garden of Toulouse, the most conspicuous symptom of which was the appearance on the leaves of diffuse spots of varying size, at first whitish, later drying up and breaking through, and bearing pycnidia of *Phyllosticta hedericola* [ibid., vi, p. 35; viii, p. 119]. A closer examination of the bushes, however, showed them to be suffering from a generalized bacterial infection, in consequence of which the shoots were deformed and

the whole foliage assumed a yellowish tinge. The young leaves, of a uniform yellow colour, were relatively small and grouped in tufts at the apex of the shoots. The fully developed leaves were yellowish, much thicker than normal, and bore the whitish spots. The affected bushes did not bear fruits, although other specimens of the same age in the Garden were fruiting copiously. The bacteria [no description of which is given] were found in the tissues of the leaves and petioles, in which they destroyed the chlorophyll, and also in the shoots. The severity and nature of these symptoms render it most probable that the disease was caused in the first place by the bacteria, and that *P. hedericola* (which, furthermore, is rare in the Garden) established itself on bushes weakened by the first organism. The spores of the fungus are hyaline, continuous, rounded at the ends, cylindrical, sometimes slightly bent, and measure 8 to 10·4 by 2·6 μ, and entirely agree with those of *P. hedericola*. The authors do not see any reason to maintain the variety *araliae* of this species, which was established by P. Brunaud.

MARCHIONATTO (J. B.). **Sobre algunos hongos parásitos de las gramíneas tóxicos para el ganado.** [On some parasitic fungi on cereals poisonous to stock.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxix, 4, pp. 457–462, 1 pl., 1930.

Poisoning of stock due to the consumption of fodder from cereal crops attacked by various parasitic fungi is stated to be very prevalent in Argentina, especially during the spring and autumn. The cases examined during the last six years are attributed to brome smut (*Ustilago bromivora*) [*R.A.M.*, ix, p. 288] on *Bromus uniloides*, responsible for fatal injury to sheep and also for contagious abortion in horses; the so-called 'honey paste' of *Paspalum dilatatum* produced by the attacks of *Claviceps paspali* [ibid., ix, p. 507], the sclerotia of which contain alkaloids resembling those of *C. purpurea* on rye, which is also found in the Argentine, both producing disorders in cattle and horses; and the 'false smut' of the inflorescence of 'esparto' or 'smut' grass (*Sporobolus berteroanus*) due to *Helminthosporium ravenelii* [ibid., ix, p. 230], which has been reported on several occasions to cause intoxication and abortion in cattle feeding in pastures in which it is prevalent. Brief directions are given for the control of the fungi by cultural measures and seed disinfection.

McKEE (R.) & ENLOW (C. R.). **Crotalaria, a new legume for the south.**—*U.S. Dept. of Agric. Circ.* 137, 30 pp., 6 figs., 1931.

Popular notes (contributed by G. F. Weber of the Florida Agricultural Experiment Station) are given on some diseases of *Crotalaria*, which is stated to be extensively used as a green manure and cover crop in Florida and Porto Rico and to be well adapted to the climatic conditions of certain more northerly States. Anthracnose (*Colletotrichum crotalariae*) attacks the stems of *Crotalaria striata* and *C. spectabilis* from soil level upwards, the bark being killed and sloughing off. The plant gradually dies, shedding its leaves from the base upwards and turning brownish-black. The fungus produces fruit bodies in profusion over the

cankered areas on the stems, which are also largely overgrown by a species of *Fusarium*.

Both the above-mentioned species are also liable to infection by *Cercospora crotalariae*, which may cause almost entire defoliation of *Crotalaria spectabilis*. Dark, slightly sunken, irregular spots are scattered over the leaves, expanding to as much as 1 cm. in diameter and often developing whitish centres. On *C. striata* the lesions are much smaller, usually round, sunken, and tan-coloured.

Other diseases of *Crotalaria* included damping-off (*Corticium vagum*) [*C. solani*]; southern blight (*Sclerotium rolfsii*) [*R.A.M.*, v, p. 652; vi, p. 638]; grey mould (*Botrytis cinerea*), which of recent years has caused heavy damage to *Crotalaria spectabilis*, the losses averaging 3 to 5 per cent. of the crop near Gainesville, Florida; and leaf spots due to *Alternaria* and *Helminthosporium* spp.

WIANT (J. S.). **Bacterial wilt of Alfalfa in Wyoming, 1930.**—*Plant Disease Reporter*, xv, 1, pp. 4–5, 1931. [Mimeographed.]

A survey of the lucerne regions of Wyoming in 1930 indicated that bacterial wilt (*Aplanobacter insidiosum*) [*R.A.M.*, x, p. 192] is widespread and very destructive in the State, infection ranging from 20 to 100 per cent. in 17 of the 40 fields inspected in Hot Springs and Washakie Counties. Heavy damage was also observed in the 102 fields of five other counties included in the survey, necessitating the ploughing up of large acreages. The total annual loss from this cause in Wyoming is estimated at 15 to 20 per cent. of the entire crop.

WIESMANN (R.). **Untersuchungen über Apfel- und Birnschorfpilz Fusicladium dendriticum (Wallr.) Fckl. und Fusicladium pirinum (Lib.) Fckl. sowie die Schorfanfälligkeit einzelner Apfel- und Birnsorten.** [Investigations on the Apple and Pear scab fungi, *Fusicladium dendriticum* (Wallr.) Fckl. and *Fusicladium pirinum* (Lib.) Fckl., and on the susceptibility to scab of certain Apple and Pear varieties.]—*Landw. Jahrb. der Schweiz*, xlv, 1, pp. 109–156, 8 pl., 6 graphs, 1931.

A comprehensive and fully tabulated account is given of the author's investigations, conducted at the Swiss Federal Fruit Growing Experiment Station, Wädenswil, on apple and pear scab (*Fusicladium dendriticum* and *F. pirinum*) [*Venturia inaequalis* and *V. pirina*], with special reference to the occurrence of physiologic forms of these fungi and to the reaction towards the disease of some standard apple and pear varieties.

Marked differences in growth rate, colony type, sporing capacity, and extent of liquefaction of gelatine were observed in the pure cultures of both fungi from infected shoots and leaves of five apple and four pear varieties on a medium of 15 per cent. gelatine + 10 per cent. dilute pear juice at 18° C. It is concluded that the strains from each variety of both hosts represent different physiologic forms of the fungi, herein designated the Wellington, Boiken, Virginia, Grossherzog, and Gravenstein forms of *V. inaequalis*, and the Pastoren, Theiler, Gute Luise [Louise Bonne], and

Diel forms of *V. pirina*. The Boiken form of *V. inaequalis* showed the capacity to produce chlamydospores formed by segmentation of the hyphae into cells measuring 16 to 27 by 5 to 8 μ, rounded at both ends, with somewhat emarginated side walls, and capable of germination like conidia; this is believed to be the first record of chlamydospore formation in the apple scab fungus.

In dilute pear and grape juice the different physiologic forms of *V. inaequalis* and *V. pirina* showed variations in the growth rate, colour, and shape of the mycelium, in the change of colour of the medium, and in the decrease of acidity in the latter. The physiologic forms further behaved quite differently on yeast extract kept at the neutral point or mixed with varying quantities of tartaric acid. The Wellington form of *V. inaequalis* made the best growth in yeast extract with tartaric acid at a concentration of 0·2 per cent., Grossherzog at 0·1 per cent., Boiken at 0·3 per cent., and Virginia at the neutral point. All forms from pear made the best growth at the neutral point, except Gute Luise, which developed most profusely with an addition of 0·1 per cent. tartaric acid.

In addition to the physiological differences between the various strains of *V. inaequalis* and *V. pirina* used in these experiments, certain morphological differences were also observed. Thus, the peak of the curve for the conidial length of 500 conidia in the Wellington form of *V. inaequalis* was at 24 μ, the corresponding figures for Boiken, Gravenstein, and Virginia being 21·2, 20, and 18·6 μ. The Wellington conidia are mostly elongated, slender, pointed, and slightly constricted in the middle; those of Boiken are similar, but without the long points; in Virginia and Gravenstein they are generally of a squat, bluntly oval type. The longest conidia of *V. pirina* were found in the Gute Luise form (peak at 22·6 μ), and the shortest in Theiler (18·6 μ).

Inoculation experiments with pure cultures of the apple and pear scab organisms gave mostly negative results, whereas those with conidia from leaves of the different varieties were generally successful. It was found that the conidia from a given host were at least twice as virulent to the leaves of the same variety as to those of others (secondary hosts). The physiologic forms further differ in their capacity to infect the secondary hosts, from which it was possible to obtain some information as to the relative susceptibility of the varieties used. Thus, the susceptible Gravenstein and Virginia apple varieties are relatively easily infected by the Wellington and Boiken forms as well as by their own. Gute Luise pear leaves proved relatively susceptible to the forms from Pastoren, Theiler, and Diel. In the apple scab fungus a certain correlation was apparent between the capacity to grow in acid media and the virulence of the different forms towards their chief and secondary hosts.

MOORE (M. H.). **The incidence and control of Apple scab and Apple mildew at East Malling.**—*Journ. Pomol. and Hort. Science*, viii, 4, pp. 283–304, 4 pl., 1930.

This is a brief discussion of the results obtained in experiments on the control of apple mildew [*Podosphaera leucotricha*] which were conducted at the East Malling Research Station simul-

taneously with those already reported on the control of apple scab [*Venturia inaequalis*: *R.A.M.*, x, p. 37]. Of all the preparations tested, the best (although not complete) control of mildew on the Cox's Orange Pippin and Stirling Castle varieties was afforded by one pre-blossom application of 1 in 30 lime-sulphur, followed by two post-blossom applications at 1 in 100 concentration, gelatine being used as a spreader on Stirling Castle. The addition of lead arsenate to lime-sulphur did not appear to lessen the fungicidal efficacy of the latter. It was shown, however, that post-blossom sulphur-containing sprays, including lime-sulphur, are not safe on Stirling Castle, on account of the very severe leaf and fruit drop, and reduction in the number of fruit buds subsequently formed, which are caused by them; there also was evidence that a pre-blossom application of 1 in 30 lime-sulphur at the 'pink bud' stage on this variety reduced the number of fruits harvested. Bordeaux mixture proved of little value in the control of mildew on Cox's Orange Pippin, on which it was also shown to cause severe leaf scorch and defoliation when applied after blossoming, and fruit russeting and partial loss of crop when applied before or after blossoming, the injury being considerably increased when hydrated lime was used instead of quicklime in the preparation of the mixture. In preliminary spraying and dusting experiments with the Belle de Boskoop variety, very good control of mildew was given by two post-blossom applications of 20–10–100 sodium carbonate soap solution, which, however, caused so much fruit drop and scorching of the young tips of the year's growth that it is considered to be unsafe at this strength on this variety. All the other preparations tested gave little consistent promise.

Several proprietary sprays were tested on some of the newer varieties of apples, and while none of them showed any distinct advantage over Bordeaux or lime-sulphur in the control of scab, some proved, in the one year's experiments, to be distinctly injurious at the concentrations recommended by the manufacturers. Finally, it was shown that, as for scab, the rootstock has a considerable influence on the susceptibility of the trees to mildew [ibid., x, p. 159].

Sawsdarg (E. E.) & Yatzinina (Mme K. N.). О применении препаратов серо-извести в борьбе с паршею плодовых деревьев. [On the use of lime-sulphur preparations in the control of scab of fruit trees.]—*Morbi Plantarum*, Leningrad, xix, 3–4, pp. 123–148, 12 graphs, 1930. [German summary.]

A detailed account is given of spraying experiments in 1929 in the neighbourhood of Moscow, the results of which showed that four applications (beginning from the pink bud stage) of lime-sulphur or calcium polysulphide were nearly as effective as the same number of treatments with 1 per cent. Bordeaux mixture in the control of apple scab [*Venturia inaequalis*], while barium polysulphide was much less efficacious. A pre-blossom application appeared to reduce leaf infection to a certain degree, but had no definite effect on the development of the disease on the fruits, and is not therefore considered to be commercially warranted. On the other hand an additional spraying just before harvest was

shown to have a considerable controlling effect on the development of scab in storage and, in general, to have a beneficial action on the keeping quality of the apples. The three local varieties of apple tested (representative of the summer, autumn, and winter groups) showed variations in their response to the treatment with the different preparations; in the summer variety (Antonovka) the best results were given by 1 per cent. Bordeaux mixture, closely followed by 1 in 40 lime-sulphur solution; in the autumn variety (Grushevka) 1 in 50 lime-sulphur was most effective, and in the winter variety (Borowinka) 1 in 60 and 1 in 75 lime-sulphur.

A small series of preliminary experiments on young, non-fruiting pear and cherry trees infected with *Fusicladium pirinum* [*V. pirina*] and *F. cerasi* [*V. cerasi*], respectively, showed that lime-sulphur solutions are also effective in the control of these diseases, as judged by the reduction of leaf infection. It is pointed out, however, that none of the fungicides tested gave absolute control of the diseases either on apple or on pear.

CARNE (W. M.), PITTMAN (H. A.), & ELLIOTT (H. G.). **Notes on wastage of non-parasitic origin in stored Apples.**—*Journ. Australian Council Sci. & Indus. Res.*, iii, 4, pp. 193–203, 2 pl., 1930.

The forms of wastage of non-parasitic origin in stored apples discussed in this paper [which is in continuation of the authors' studies of this problem: *R.A.M.*, x, p. 114] include superficial and lenticel scald, Jonathan spot, lenticel blotch, split core, and mouldy core. Superficial scald occurs chiefly in yellow apple varieties (e.g., Granny Smith and Dunns); it may develop as brown to almost black irregular spots or blotches, or as a general discoloration involving only the skin or a few layers of the underlying cells at the most. Although detrimental to the market value of the fruits, it does not usually affect their table or keeping qualities. This defect does not develop during the first two months of storage, and a thorough ventilation towards the end of this period tends to prevent its subsequent appearance, the general inference being that it is caused by the excessive concentration in the store room atmosphere of the gases produced by the fruit. It was shown that susceptibility to superficial scald is increased with the immaturity of the fruit, the temperature of storage, and with the delay in placing the fruit in cold storage when packed; sunburn, even when hardly noticeable, appears to predispose the apples to the trouble.

Lenticel scald, which has apparently been confused by some workers with Jonathan spot, appears as a brown spot affecting the lenticels and the immediately adjoining skin, and may occur either alone or in association with superficial scald. It is apparently identical with the lenticel spot of Mrs. Kidd and Beaumont [ibid., iv, p. 483]. So far as the authors are aware, neither of these two forms of scald have been reported as occurring in Australian apples imported into Europe.

In view of the confusion existing as to the exact identity of Jonathan spot, a new definition of this disease is given, which is based on observations in Australia, New Zealand, and North

America. It is now defined as a non-parasitic disease of certain red or partially red varieties, notably Jonathan and Esopus Spitzenberg, characterized by rather ill-defined, greenish-yellow to brown or almost black, slightly depressed spots, streaks, or blotches, involving only the epidermal tissues, and much more frequent on the red than on the non-flushed surfaces. Though lenticels are necessarily involved in the larger spots, there is no evidence of any causal relation between the trouble and lenticels. Although it may occur in the field, Jonathan spot is mainly a storage trouble, the liability to which increases with the length of storage and with the maturity of the fruit when picked. It does not effect the eating or keeping qualities of the apples, and in the authors' experience, the spots are not liable to fungal invasion.

The name lenticel blotch is suggested for a trouble which has hitherto been frequently confused with Jonathan spot. It was found by the authors on Jonathans and Spitzenbergs in Western Australia, and on Spitzenbergs from Victoria. The lesions tend to develop towards the calyx end of the apples, without any definite relation to the coloured areas. Isolated lesions have each a lenticel in the centre; they are larger than the spots of the spotting form of Jonathan spot, and are frequently, almost typically, confluent, forming irregular blotches up to 1 cm. or more in diameter; they are sharply defined and definitely depressed, though involving only the skin and a shallow layer of cells beneath. Fungal invasion is not infrequent, when the spots assume the circular shape common to fungal rots. Although the cause of this disease is not known, its common association with bitter pit suggests a relationship between the two. In the authors' experiments, it occurred mainly in shed-stored fruit, and only to a slight extent in fruit placed in cold storage within a week from picking. It has occasionally been noted in Jonathans during the inspection of the fruit for export.

In summarizing the information already given [ibid., viii, p. 511] on the 'woolly stripe', 'hollow core', and 'mouldy core' defects in certain varieties of apple, especially Cleopatra, the authors propose the term 'split core' for any rupture of the endocarp involving the fleshy parts of the core. In severe cases, the greatest rupture tends to take place in the same plane on opposite sides of the core, so that two carpels split badly, dividing the fruit into two halves; sometimes, one or two more carpels may split, forming ruptures at right angles to the first. Splitting occurs some time before the fruit reaches full growth, and badly affected fruit tends to become irregular in shape, this being the only external symptom of the trouble. The irregularities take the form of depressions at the calyx end, in the same planes as the cracks, while the fruit as a whole tends to be flattened adjacent to the cracks. In Cleopatra apples the percentage of split core does not appear to vary greatly in any season, but the size of the cracks is markedly increased in light as compared with heavy crops. Apples affected with split core are very susceptible to mouldy core.

The paper terminates with a few general considerations of the causes of wastage in Australian apples exported overseas, and of the measures for their control both in the orchard and in transit.

PALMER (R. C.). **Recent progress in the study of Jonathan breakdown in Canada.**—*Scient. Agric.*, xi, 5, pp. 243–258, 4 figs., 1931.

This is a preliminary report of the results of experiments conducted since 1923 at the Summerland Experiment Station, British Columbia, for the purpose of determining the causes and control of the condition in apples known as Jonathan breakdown or flesh collapse [inherent internal breakdown: *R.A.M.*, viii, p. 253] for the reason that the Jonathan variety is especially susceptible to it, although it has been observed in several other varieties as well. The trouble is very prevalent in Western Canada, especially in British Columbia, where apple growers are stated to have suffered direct losses of some $400,000 in rebates for breakdown during the period from 1922 to 1929.

The results of seven years' experiments and observations indicated that Jonathan breakdown is much more serious in some seasons than others, and that heavy rains or artificial irrigation towards the close of the growing season enhance the susceptibility of the apples to the disease. Severe pruning and heavy thinning of the fruit were also shown to be conducive to the development of the trouble, and there was evidence that fruit from trees top-grafted on vigorous stock is especially liable to it. In general, any orchard practice or cultural treatment that promotes a very vigorous growth of tree and fruit appears to increase the susceptibility of the latter, and it is believed that the amount of leaf surface per apple probably is of paramount importance in determining susceptibility to breakdown. There was strong evidence that apples from heavily laden trees are less liable to the trouble than those from trees with a light crop.

The amount of breakdown developing in the fruit was also found to have a direct relationship to the lateness of the date of picking, size of fruit, and amount of red colour in the apples at the time of picking. Although the development of red colour is related to the degree of maturity, it is not an entirely satisfactory test of ripeness in Jonathan apples, while the change in colour (from leaf-green to a clear yellow) of the skin on the unblushed side of the fruit has proved to be a fairly reliable maturity index. Storage experiments showed that while humidity and temperature did not influence to any considerable degree the ultimate amount of breakdown, the trouble developed much more rapidly under ordinary storage (cellar) conditions than in cold storage at 32° F.

Some details are finally given of a plan which has been worked out on the basis of these observations for the purpose of controlling the trouble in Canada, one of the chief recommendations of which is that trees carrying a light crop should be harvested earlier than those which are heavily laden with fruit.

STEPANOFF (K. M.). Заметка о **Fusarium rhizogenum Pound et Cl.** в Астраханском Округе. [Note on *Fusarium rhizogenum* Pound & Cl. in the district of Astrakhan.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 55–60, 1930. [German summary.]

This is a brief account of a rot which was found in 1929 affecting

the roots of nursery stock in two commercial fruit nurseries in the district of Astrakhan, and causing heavy mortality among the seedlings and young grafted trees, particularly of apple and cherry. Other species attacked included quince (*Cydonia vulgaris*), damson (*Prunus insititia*), and rock cherry (*P. mahaleb*). The roots of the dead seedlings were moist on the surface, and bore a white, loose mycelial felt with white or faintly pink sporiferous cushions of a denser consistency. The spores were hyaline, cylindrical, with rounded ends, straight or slightly bent, one- to three-septate, 22 to 27 by 4 to 4·2 μ in diameter, and borne on sparsely branched conidiophores disposed in more or less dense tufts. The fungus is referred to the species *Fusarium rhizogenum* Pound and Clements, although the dimensions of the spores are somewhat below those given in the diagnosis of the latter (38 to 45 by 4 to 5 μ). This is stated to be the first record of the organism from the district of Astrakhan, and it is believed to have been introduced in recent years with nursery material from the Ukraine, which was found on examination to be contaminated with the same fungus. The pathogenicity of the *Fusarium* was not experimentally tested, and it is thought probable that its heavy outbreak in 1929 was in part due to the severe frosts which prevailed in the previous winter.

GOLDSWORTHY (M. C.) & SMITH (R. E.). **Studies on a rust of Clingstone Peaches in California.**—*Phytopath.*, xxi, 2, pp. 133–168, 9 figs., 1 graph, 1931.

During 1926 and 1927 canning peach trees in central California were attacked in a destructive form by the rust *Puccinia pruni-spinosae* [*R.A.M.*, viii, p. 341], the symptoms of which are fully described.

The organism was observed only in the uredo stage. It was found to overwinter chiefly on twig infections originating in the autumn, remaining latent and invisible throughout the winter, and developing uredosori in the early spring. To some extent the rust was also carried over by the overwintering of older sori on the previous season's twigs and by renewed production of uredospores from such sori in the spring. The subsequent infection of the leaves and fruit was shown to depend on rainfall of several days' duration combined with high atmospheric humidity. A period of at least three hours in a moisture-saturated atmosphere was found to be necessary to induce germination of the uredospores. The viability of these spores when still on living leaves extends over a period of about six weeks, somewhat less on detached dry ones. The uredospores of the rust germinated over a temperature range from 8° to 38° C., with an optimum between 13° and 26°; the germ-tubes grew best at about 22°.

The peach rust did not attack prune, almond, apricot, or cherry trees in the Sacramento Valley, even when they were in immediate proximity to badly infected peaches. In the Santa Clara Valley the teleuto stage was found in profusion on prune leaves in the late autumn, but the rust was not observed on peaches even when adjacent to infected prune orchards.

Sulphur and sulphur compounds, e.g., commercial dry lime-

sulphur (Sherwin-Williams), sodium sulphide compounds, and a mixture of sulphur dust and liquid gas-house residue sulphur paste proved to be more toxic to the germinating uredospores of the peach rust than copper preparations. Mineral oil appeared to stimulate the germination of the spores.

Green (D. E.). **Peach scab.**—*Gard. Chron.*, lxxxix, 2304, pp. 151–152, 2 figs., 1931.

The symptoms of peach scab (*Cladosporium carpophilum*) are briefly described in popular terms. The disease is stated to be fairly common in England on peaches and nectarines [*R.A.M.*, viii, p. 627], being seldom detected, however, until it has reached a severe stage. The safest treatment under glass is thorough dusting with green sulphur; ventilation and humidity should be carefully regulated. Early applications of Burgundy mixture, which are sometimes given to prevent leaf curl [*Taphrina deformans*], should also assist in the control of scab.

Stevens (N. E.). **The spread of Cranberry false blossom in the United States.**—*U.S. Dept. of Agric. Circ.* 147, 17 pp., 2 maps, 1931.

False blossom of cranberries [*R.A.M.*, ix, p. 728] seems to have first appeared in the United States in Wisconsin, where it spread rapidly for some years after 1900; it then very gradually declined in the central areas, but was introduced into the northern and north-central areas between 1910 and 1929. At present it is steadily becoming more prevalent in this State. The spread of the disease was at first chiefly by the dissemination of diseased vines, but its later increased prevalence is due to the leafhopper vector *Euscelis striatulus* [ibid., ix, p. 324].

It was introduced into Massachusetts by at least five consignments of vines between 1895 and 1910, spread being relatively slow up to 1919 but rather rapid since. In New Jersey, where the disease was introduced at least twice before 1909 and probably several times later, false blossom has spread very rapidly since 1924. These are the two chief cranberry-growing States, Massachusetts producing about 60 per cent. of the crop grown in the United States. Spread has been very little in Washington and Oregon, where the disease was introduced several times between 1912 and 1914.

The recent rapid spread of the condition would appear to have been favoured by the planting of highly susceptible varieties; by the rebuilding of the bogs after the war, which by increasing the vine growth also favoured the insect vector; and, in particular, by the practice of flooding the bogs for the control of insects before the end of June, in order to avoid flood injury to the plants. This early flooding is less effective in controlling the leafhoppers. That the spread has been more rapid in Massachusetts and New Jersey than at any time in Wisconsin is due to the greater number of leafhoppers in the eastern States, the fewer varieties of cranberry, and the greater freedom from frost. The ability to flood the bogs should give greater control of *E. striatulus* than has been accomplished against other disease-carrying leaf-

hoppers, and investigations are in progress to ascertain the limits of safety to be observed in flooding.

PARK (M.). **Some diseases of Plantains in Ceylon.**—*Trop. Agriculturist*, lxxv, 6, pp. 347–353, 1930.

In this paper [which was read at the fourth agricultural conference at Peradeniya] the author briefly discusses the etiology and control of some of the more important diseases of plantains (*Musa paradisiaca*) known to occur in Ceylon, including bunchy top [*R.A.M.*, x, pp. 80, 117]. Since 1913, when this disease is stated to have first made its appearance in the district of Colombo, bunchy top has spread to the majority of the plantain-growing areas in the island, with the exception of the Tissa district. In view of the difficulty of controlling the insect vector (*Pentalonia nigronervosa*) under field conditions, the only feasible treatment of the disease is the complete eradication of all diseased plants, which should be cut into thin longitudinal slices, dried as rapidly as possible, and either burnt or buried in deep holes. Anthracnose of immature fruits (*Gloeosporium musarum*) [ibid., ix, p. 627] is not of sufficiently common occurrence in Ceylon to warrant general spraying with Burgundy mixture (which has given satisfactory control in India), but spraying should be resorted to in cases of severe and repeated outbreaks. It is believed that Bordeaux mixture or a lime-sulphur spray would give as good results as Burgundy mixture, and that in the meantime general sanitary measures and the avoidance of injuring young bunches will tend to reduce the incidence of the disease. A bacterial disease closely corresponding to the 'moko' disease in Trinidad (*Bacillus musae*) [*Bacterium solanacearum*: ibid., v, p. 346] has been reported on a few occasions; the organism isolated from the affected plants failed, however, to reproduce the disease when inoculated into healthy plants, thus leaving its identity in doubt. Two reports have also been received of a wilt disease with symptoms resembling those of Panama disease [*Fusarium cubense*: ibid., x, p. 254].

MAGEE (C. J.). **A new virus disease of Bananas.**—*Agric. Gaz. New South Wales*, xli, 12, p. 929, 1930.

In May, 1929, an apparently new disease was reported from banana plantations, at least one of which incurred serious losses, in the vicinity of Nimbin, New South Wales. In young plants the disease first appears as whitish or yellowish-white streaks, which may extend from the midrib to the margin of the most central leaves. These chlorotic areas may vary from narrow streaks to bands half an inch or more broad. In some leaves the streaks are not continuous, with the result that a green and yellow mottling is produced. The mottled foliage is produced throughout the summer, and may persist all through the year, but in winter many plants begin to rot at the heart leaf, the rotting extending down into the corms and finally killing the plant.

Preliminary experiments have shown that the condition, which probably belongs to the virus group, is infectious, and may be transmitted by the banana aphid (*Pentalonia nigronervosa*).

JOHNSON (J. R.). **Enfermedades y plagas de la Piña en la América tropical.** [Diseases and pests of the Pineapple in tropical America.]—*Rev. Agric. Puerto Rico*, xxvi, 7, pp. 4–11, 6 figs., 1931.

Popular notes are given on the symptoms, causes, and control of some diseases affecting pineapples in tropical America. *Ceratostomella paradoxa* is the most important fungus attacking the exported fruit in the Antilles and Central America [cf. *R.A.M.*, viii, p. 733]. Various measures [which are indicated] have been adopted to prevent infection by the fungus, but generally speaking, the results hitherto obtained are somewhat inconclusive. In a few tests the cauterization of the cut end of the stem with a hot iron proved satisfactory. The immersion of the entire fruit in a solution of hot borax was effective in some cases but not in others, while the storage of the fruit in refrigerators is usually, but not always, successful. The variety most resistant to *C. paradoxa* is Red Spanish, followed by Chocona. The same fungus is also responsible for a rotting of the leaf bases and shoots in the field.

Black rot of the fruitlets is associated with the presence of a species of *Penicillium* or *Aspergillus*, in addition to mites as in Queensland [ibid., vii, p. 225; viii, p. 53]. The Pan de Azúcar, Chocona, and other varieties relatively poor in acid are more susceptible to this disease than Red Spanish.

Crown rot, characterized by a soft white decay of the leaf bases, is most prevalent on the Santa Clara, Red Spanish, and Montúfar varieties, the Spiney Bocas being highly resistant. The disease appears to be due to different causes in various countries, having been attributed by Ashby to a species of *Phytophthora* in Jamaica, to *P. terrestris* [*P. parasitica*] by Bruner in Cuba [ibid., iv, p. 528; ix, p. 325], and to an unspecified bacterium in Costa Rica.

Reddening of the fruit, due to an unknown cause, has been reported only from Costa Rica. Though hardly more than a blemish, this condition detracts from the market value of the pineapples.

Tangle root [ibid., viii, p. 53] has been reported from Florida on the Golden Queen and Smooth Cayenne varieties. Affected plants should have their roots cut short and be transferred to a fresh site on well-prepared soil.

Spots of varying size, shape, and colour are of frequent occurrence on pineapple leaves in tropical America, and have also been reported by Larsen from Hawaii, where they are attributed to *C. paradoxa* following insect or other injuries. The lesions may be large, white, and prominent or quite inconspicuous. Some are straw-coloured with a dark margin, while others are black, due to the formation of the macrospores of *C. paradoxa* between the tissues, which are soft and rotten at first, and later shrivel and collapse. In the early stages the spots may either be olive-coloured and fairly regular in shape or white and irregular from the first; they expand very rapidly, and may eventually attain a diameter of 2 to 6 in., sometimes up to 1 ft.

Notes are also given on the occurrence and control of chlorosis in Porto Rico and Hawaii [ibid., vii, p. 805].

LINFORD (M. B.). **Yellow-spot disease of Pineapples transmitted by Thrips tabaci Lind.**—*Science*, N.S., lxxiii, 1888, p. 263, 1931.

Thrips tabaci has been found to be an important vector of the destructive yellow spot (infectious chlorosis) of pineapples in Hawaii, while it also carries the virus to pineapples from certain weeds, especially *Emilia flammea*.

In many respects yellow spot resembles other diseases of the mosaic and ring spot types, while in others it stands alone. The first symptom is a distinct 'initial spot', 5 to 20 mm. in diameter, circular, chlorotic, often with concentric dark and light bands, and somewhat hypertrophied. Extending downwards from the initial spot and developing on the younger leaves of the plant are chlorotic stripes and circular spots, sometimes markedly zonate. Plants in which the disease is of long standing may occasionally show a coarse mosaic pattern. Other features of yellow spot include unilateral dwarfing, leading to marked curvature of the plant, followed by necrosis of the affected parts and decay, associated with secondary micro-organisms, after a few weeks.

Closely connected with the field occurrence of yellow spot is a virus disease of *E. flammea* which is also characterized by ring spot and mosaic symptoms. Thrips collected from this diseased weed in the field and allowed to feed on healthy pineapple and *E. flammea* seedlings transmitted the virus, producing yellow spot in the former and ring spot in the latter.

Pedigreed non-viruliferous colonies of *T. tabaci* were established, each starting from a single larva which was removed to an insect-free *E. flammea* or pea seedling at the moment of hatching. Insects from such colonies proved non-infective both to *E. flammea* and pineapple seedlings. However, when placed on diseased *E. flammea* plants, these non-viruliferous thrips acquired the virus and transmitted it to both *E. flammea* and pineapple in a high percentage of cases.

HORNE (W. T.) & PARKER (E. R.). **The Avocado disease called sun blotch.**—*Phytopath.*, xxi, 2, pp. 235–238, 2 figs., 1931.

This is an expanded account of the writers' investigations on the infectious chlorosis of the avocado known as sun blotch in California, a brief notice of which has already appeared [*R.A.M.*, x, p. 196].

PITTMAN (H. A.). **Bordeaux mixture. Simple directions for its preparation in either small or large quantities.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., vii, 4, pp. 600–609, 2 figs., 1930.

This paper, written in popular language, points out the advantages and drawbacks of Bordeaux mixture as compared with other liquid fungicides, and gives detailed instructions for the home preparation of the mixture both in large and small holdings. A list is appended of spreaders other than calcium caseinate which may be used when the latter is unobtainable.

HOCKENYOS (G. L.). **Solubility of Bordeaux.**—*Phytopath.*, xxi, 2, pp. 231–234, 1931.

The writer has applied a highly sensitive colorimetric method, recently devised by T. Callan and J. A. K. Henderson (*Analyst*, liv, p. 650, 1929), to the determination of the solubility of the copper compounds in Bordeaux mixtures. Essentially the method consists of taking 17·5 c.c. of the solution to be determined and adding successively 0·5 c.c. ammonium hydroxide and 2 c.c. sodium diethyldithiocarbonate. The coloured solution thus produced is compared with a standard similarly prepared in a Duboscq colorimeter (e.g., 2 c.c. of a 1/5,000 N solution of copper sulphate to 17·5 c.c. and proceeding as above).

In order to ascertain the solubility of metallic copper itself, samples of copper wire cleaned by scraping were placed in boiled and aerated distilled water, respectively; the percentage of copper in the former after 9 days was found to be 0·00104 and in the latter 0·00039. The percentages of copper in the supernatant fluid of seven 1 per cent. Bordeaux mixtures after three days' settling ranged from 0·03 (greenish precipitate) to 0·00014 (medium and dark blue). The addition of sugar to the formula was found to produce a deep blue colour both in the precipitate and in the supernatant liquid. A solution containing 0·5 per cent. sugar was found to contain 0·078 per cent. copper actually in solution.

SIMSKII (A.). **Ability of dry fungicides to adhere to seeds.**—*Fertilizers and Crops*, ii, pp. 206–212, 1930. (Russian.) [Abs. in *Chem. Abstracts*, xxv, 7, p. 1621, 1931.]

Into glass-stoppered jars of 600 c.c. capacity 200 gm. of seed-grain is introduced and placed in cups of a revolving drum. The fungicide is added and the drum kept at a definite speed for different periods. The seeds (wheat, oats, and barley) are then taken out, passed over a 100-mesh sieve, washed, and the amount of dusting material taken up is determined. Copper carbonate and copper sulphate dusts were washed with a weak solution of hydrochloric acid. It was found that copper carbonate and anhydrous copper sulphate adhere best to wheat. The longer the seeds are mixed with the dusts the more is taken up.

HOGGAN (ISMÉ A.). **Further studies on aphid transmission of plant viruses.**—*Phytopath.*, xxi, 2, pp. 199–212, 2 figs., 1931.

This is an expanded account, accompanied by statistical data in tabular form, of the author's researches on the transmission of plant viruses by aphids in Wisconsin [*R.A.M.*, ix, pp. 413, 428].

EULER (H. v.), HERTZSCH (W.), MYRBÄCK (S.), RUNEHJELM (D.), & FORSSBERG (A.). **Chemical changes in infectious chlorosis in leaves of Abutilon.**—*Arkiv. Kemi Mineral. Geol.*, x B, 13, 6 pp., 1930. (Swedish.) [Abs. in *Chem. Abstracts*, xxv, 7, p. 1554, 1931.]

The portions of *Abutilon* leaves suffering from infectious chlorosis [*R.A.M.*, vii, p. 385] are stated to be characterized by a

much lower catalase activity, a higher proportion of amino nitrogen, less chlorophyll, xanthophyll, and carotene, and less tryptophane than the normal green areas.

BORM (L.). **Die Wurzelknöllchen von Hippophaë rhamnoides und Alnus glutinosa.** [The root nodules of *Hippophaë rhamnoides* and *Alnus glutinosa*.]—*Bot. Arch.*, xxxi, 3–4, pp. 441–488, 23 figs., 1931. [English summary.]

Full details are given of the writer's investigations, conducted at Königsberg, Prussia, on the root nodules of *Hippophaë rhamnoides*, alder (*Alnus glutinosa*) [*R.A.M.*, viii, p. 615], and certain Cycadeae.

The bacterial endophytes were found to infect quite distinct regions of the galls, the anatomy of which is described. The infected cells are hypertrophied. The nucleus becomes amoeboid and the endophytes multiply to such an extent that they finally occupy the entire cell, the residue of the nucleus being barely discernible. At this stage phagic processes are initiated which result in the destruction of the bacteria. The remaining mass is resorbed by the adjacent cells so that the digested cells are pressed together in narrow lines. The phagic processes and the accompanying transformation of the bacteria may be observed on agar slides as well as in the cell under unfavourable nutritional conditions. In the case of *A. glutinosa* the bacteria were found to fix nitrogen.

HASSELBAUM (GERTRUD). **Cytologische und physiologische Studien zur ericoiden endotrophen Mycorhiza von Empetrum nigrum.** [Cytological and physiological studies on the ericoid endotrophic mycorrhiza of *Empetrum nigrum*.]—*Bot. Arch.*, xxxi, 3–4, pp. 386–440, 6 figs., 1931. [English summary.]

A comprehensive account is given of the writer's cytological and physiological investigations, conducted at Königsberg, Prussia, on the endotrophic mycorrhiza of *Empetrum nigrum* and other Ericaceae, namely, cranberry (*Vaccinium oxycoccus*), *Calluna vulgaris*, and *Andromeda polifolia* [cf. *R.A.M.*, viii, p. 455; ix, p. 196].

E. nigrum was found to possess both host and digestive cells which are clearly distinguishable morphologically. In the former the endophyte forms clumps of thick hyphae which are not digested, while in the latter sporangioles destined to be digested are produced. The process of digestion begins near the cell nucleus of the host, whence it extends to the hyphae lying towards the periphery. During digestion the cell nucleus becomes amoeboid, its nucleoles disintegrating to produce enzymes in the cytoplasm. The fungus isolated from mycorrhiza of *E. nigrum* was identified as a species of *Mortierella* which made good growth on a soil decoction-glucose-peptone-agar medium. Cuttings of *E. nigrum* were found to thrive in sterilized soil free of fungi. Infection of the roots proceeds from the soil and varies in intensity according to the season and habitat of the host, so that the latter may be regarded as facultatively mycotrophic.

PEYRONEL (B.). **Simbiosi fungina tipo 'Lolium' in alcune Graminacee del genere 'Festuca'.** [Fungal symbiosis of the *Lolium* type in certain Gramineae of the genus *Festuca*.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxvii, 3, pp. 643–648, 1930.

After referring to the symbiotic relation existing between various species of *Lolium* and a fungus the mycelium of which grows in the caryopses immediately outside the aleurone layer, infection beginning in the seedling and gradually spreading to the stem, leaves, inflorescences, and finally to the new ovary [*R.A.M.*, viii, p. 434], the author states that he examined thirty [listed] species of Gramineae growing in the Valli Valdesi region of Piedmont, of which the only ones that showed this type of symbiosis were *L. perenne*, *Festuca spadicea*, *F. duriuscula*, and *F. glauca*. The behaviour of the fungus was substantially the same in all these grasses.

The intracellular mycelium consists of filiform, septate, little branched, hyaline hyphae 2 to 3 μ in diameter and with very short haustoria. It does not show any very marked growth in the vegetative organs, except in the thick, fleshy sheaths of the *Festuca* species. The author never found it in the leaf blades, and it was absent from all the chlorenchyma. In the leaf sheaths it develops in the innermost part of the parenchyma, between the fibrovascular bundles; it extends a short distance into the base of the leaf, where a colourless parenchyma still exists. In the culm it develops almost exclusively in the medullary parenchyma. From the last internode it passes into the rachis, whence it penetrates (in the *Festuca* species) through the peduncles of the ear into the rachillae and flowers, which become infected before fertilization has taken place. The mycelium invades the base of the glumes, especially of the upper ones, often growing abundantly between the glumes and the paleae, and between the last-named and the ovary. Apparently, the paleae are attacked only when, having ceased to function, they become soft. The ovary is invaded from the base; the mycelium encircles the ovule and passing through the micropyle between the two teguments and into the nucellus, it surrounds the embryo sac. At first it forms a thin layer, but it grows more vigorously as the embryo and the endosperm develop. When the caryopsis is fully grown, the fungus is present between the aleurone cells and the endocarp. It also forms a thick mycelial weft between the scutellum and the endosperm.

The roots were unaffected, although they showed the phycomycetoid mycelium of the endotrophic mycorrhiza common to most herbaceous plants [cf. ibid., v, p. 379], which, the author emphasizes, is not the same as the mycelium of the fungus described above.

All attempts to obtain the endophyte in culture gave negative results.

Referring to Agostini's statement that she had successfully isolated the true endophyte of *L. temulentum* and determined it as *Alternaria lolii-temulenti* [ibid., v, p. 743] the author points out that this still awaits confirmation. In his opinion it is highly improbable that any species of the Dematiaceae would form such a delicate association as this. The flowers of the Gramineae are

attacked by numerous fungi, some of which, especially species of *Alternaria* and *Cladosporium*, can invade the stigmata and stamens, especially after fertilization, as well as the glumes, when these are withering. *Alternaria* is particularly adapted to the invasion of weakened organs, and is commonly found, for instance, in wheat grains.

VOLK (A.). **Beiträge zur Kenntnis der Wechselbeziehungen zwischen Kulturpflanzen, ihren Parasiten und der Umwelt. (4. Mitteilung.) Einflüsse des Bodens, der Luft und des Lichtes auf die Empfänglichkeit der Pflanzen für Krankheiten.** [Contributions to the knowledge of the interrelations between cultivated plants, their parasites, and the environment. (Note 4.) Influences of soil, air, and light on the susceptibility of plants to diseases.]—*Phytopath. Zeitschr.*, iii, 1, pp. 1–88, 28 figs., 2 graphs, 1931.

Continuing the investigations initiated by Schaffnit on the interrelations between cultivated plants, their parasites, and environmental factors [*R.A.M.*, ix, p. 667], the writer made extensive observations and experiments [the results of which are fully discussed and tabulated] on the part played by external conditions in determining the incidence of various well-known diseases on different crops in Germany.

Tobacco wildfire (*Pseudomonas* [*Bacterium*] *tabaci*) was found to develop more rapidly on plants with a deficiency of nitrogen, an excess of potash, and abundant phosphoric acid than on those supplied with plenty of nitrogen, but little potash, and particularly with small amounts of phosphoric acid [ibid., x, p. 63]. Resistance to artificial inoculation was lowest in the plants receiving an abundance of nitrogen and little potash, a fact which appears to be correlated with the poor development of the cell walls and the large number of wide open stomata.

Little difference was observed in tomatoes receiving varying amounts of the above-mentioned constituents in regard to their susceptibility to mosaic [ibid., vii, p. 659]. The incubation period is considerably lengthened by deficiency of phosphoric acid, while the absence of nitrogen temporarily prevents the appearance of the symptoms which develop, however, when nitrogen is supplied. Streak of tomatoes [ibid., x, p. 213] occurred in the most virulent form on the plants receiving an excess of potash or phosphoric acid and on those without nitrogen. The incubation period was prolonged by a shortage of phosphoric acid and the number of successful inoculations was reduced; the infected plants, however, were nearly all killed. In tobacco mosaic, the mildest symptoms occurred on plants with a limited supply of nitrogen. The disease was equally severe on young plants receiving an excess of any one constituent and on those suffering from potash deficiency; with advancing age the leaf malformations are more pronounced on the plants without potash and with abundant nitrogen.

No difference in the susceptibility of Lucullus tomatoes to leaf mould (*Cladosporium fulvum*) was detected among plants grown in soils with different moistures between 50 and 80 per cent. of

the water-holding capacity [ibid., ix, p. 349]. On wilting plants, however, in soil with a water content of 25 to 30 per cent., the incubation period was prolonged, the fructifications more abundant, and the viability of the fungus extended. In a similar test with Petkus rye, mildew (*Erysiphe graminis*) [ibid., x, p. 173] was considerably more virulent on plants grown in soil with 40 per cent. of the water-holding capacity than with 60 or 80 per cent. As in the case of *C. fulvum*, the incubation period was prolonged on wilting leaves and in soils with a 20 per cent. water content. Rust (*Puccinia dispersa*) [*P. secalina*] on Petkus rye was most prevalent in soils with a water content of 60 to 80 per cent. [ibid., viii, p. 555]; at 40 and 20 per cent. the plants react to infection by the development of dirty grey-green, necrotic areas without disorganization of the chlorophyll, while on wilting leaves the number of successful inoculations was very low and the resulting pustules minute.

In experiments on the infection by *C. fulvum* of tomatoes, and by *Phytophthora infestans* of potatoes, grafted on various other members of the Solanaceae, modifications were observed in the mutual relations of host and parasite conditioned by the better or poorer development of the scion according to the various stocks used. There were, moreover, certain alterations in the type of infection (e.g., on tomato grafted on *Datura stramonium*), corresponding to the symptoms occasioned by lack of potash, and suggesting changes in the supply of mineral salts.

Tomato plants grown in darkness were more severely injured by *C. fulvum*, and rye plants under similar conditions by *E. graminis* and *P. secalina*, than those in the light, though this did not appear to affect the growth of *C. fulvum* in pure culture, or the germination of the spores of the other two fungi.

The highest number of successful inoculations with *C. fulvum* on tomatoes occurred at an atmospheric humidity of 95 per cent., at which concentration the incubation period was only 12 days as compared with 15 at 50 per cent. Similar relations were observed in the case of *E. graminis* on wheat.

Narcotization with ether (0·2 c.c. per litre of air for 24 hours) promoted the development of the mycelium and pycnidia of *Phoma betae* on beet leaves, and further rendered tomato plants more susceptible to infection by *Phytophthora infestans*. The fructification of *Puccinia secalina* on narcotized rye plants was less profuse than on the controls.

The mutual interaction of fungous parasites was most conspicuous in the relations between *Tilletia tritici* [*T. caries*] and *P. glumarum*, the growth and reproductive activity of the latter being greatly stimulated on wheat plants attacked by the former [ibid., x, p. 373]. The extension and sporulation of *E. graminis* on rye were stimulated by primary infection with *P. secalina*; on the other hand, where the latter followed *E. graminis*, its infective capacities were diminished. The incubation period of *C. fulvum* was shorter on the diseased leaf areas of mosaic tomatoes than on healthy ones, presumably on account of the higher sugar content of the former.

The general conclusion arising out of these observations and experiments is that, in practice, more attention should be paid to

the modifications induced in the host by varying environmental conditions than to the influence of the latter on the parasite.

Legislative and administrative measures. France.—*Internat. Bull. of Plant. Protect.*, v, 2, p. 28, 1931.

By Decree of 26th November, 1930, the entry into France of plants and parts thereof belonging to the genera *Abies*, *Picea*, *Pinus*, *Pseudotsuga*, and *Tsuga* is prohibited as being liable to introduce *Rhabdocline pseudotsugae* [*R.A.M.*, x, p. 145]. Plants belonging to other genera may be imported into French territory if accompanied by an official sanitary certificate stating that the packages contain no plants or parts thereof belonging to the above-mentioned genera, and further, that the material consigned and the plantations in which it originates have been inspected and found free from *R. pseudotsugae*.

The Noxious Weeds and Diseases of Plants Regulations, 1930. Proclamation No. 18 of 1930. Proclamation No. 19 of 1930.—*Fiji Royal Gazette*, 64, pp. 470–475, 1930.

By the Noxious Weeds and Diseases of Plants Regulations, 1930 [cf. *R.A.M.*, ix, p. 480], no customs officer may permit the landing of plants in Fiji except on the written instruction of an inspector. All plants and packing material imported into Fiji become liable to detention and examination. No soil may be imported except under the written permission of the Director of Agriculture, and when so imported it must be fumigated with carbon disulphide under the direction of an inspector. After the inspection and, when necessary, the treatment of any imported plants, a certificate is to be issued empowering the importer to remove the articles from the fumigating station. All imported plants and wrappings may be destroyed by direction of an inspector if the importer fails to give sufficient evidence of their inclusion in the certificate [loc. cit.] issued in the country of origin or export.

An inspector is empowered to enter on any land for the purpose of inspecting the plants therein. The Director of Agriculture may by notice in the Fiji Royal Gazette prescribe the steps to be taken to control or eradicate any disease, the material with which diseased plants are to be treated, and the manner of its use.

By Proclamation No. 18 of 1930 the following (among other) plants may not be imported into Fiji without permits: coco-nuts, sugar-cane, pineapple, and citrus. All other plants may be imported without permits from Great Britain, Australia, Canada, New Zealand, and the United States of America provided that permits are required for the fruits of certain [specified] plants from Australia and for growing Rosaceae imported from Canada, New Zealand, and the United States of America.

By Proclamation No. 19 of 1930 the Colony of Fiji is declared to be infected with *Cercospora musae* on bananas, which thus becomes a notifiable disease, the plants subject to attack by which may not be removed to other places without permission from the Director of Agriculture.

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PEYRONEL (B.). **Simbiosi micorrizica tra piante alpine e Basidiomiceti.** [Mycorrhizal symbiosis between Alpine plants and Basidiomycetes.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxvii, 3, pp. 655–663, 1930.

An account is given of the author's observations on the distribution of ectotrophic mycorrhiza in the Valli Valdesi region of the Alps, where it appears that, contrary to the views expressed by earlier observers, this type of mycorrhiza is probably commoner than the endotrophic type. The Basidiomycetes found in the Alps are those which at lower altitudes form mycorrhizal associations with woody phanerogams, and at these higher elevations they form analogous relations with shrubs or even herbaceous plants.

Typical ectotrophic mycorrhiza were observed in *Salix herbacea*, *S. lapponum*, *S. reticulata*, *Helianthemum vulgare*, *Vaccinium uliginosum*, *Arctostaphylos uva-ursi*, and *Polygonum viviparum*. Most of the mycorrhiza-producing fungi found were species of *Cortinarius* and *Russula*.

S. herbacea was found in mycorrhizal association with two species of *Cortinarius* and two species of *Russula*; one of the former was probably *C. cinnamomeus*, while the other belonged to the *C. proteus* group. The two species of *Russula* are not named but are briefly described. The mycorrhiza of *S. lapponum* was probably produced by a *Cortinarius*. *H. vulgare* was found in mycorrhizal association with a *Cortinarius* which probably was *C. proteus*, and with two species of *Russula*, one belonging to the group *R. chamaeleontina*, the other similar to but larger than the two species of *Russula* associated with *S. herbacea*.

V. uliginosum, in addition to the endotrophic mycorrhiza peculiar to the Ericaceae, also bore ectotrophic mycorrhiza produced by a *Cortinarius*.

In *A. uva-ursi* the author found two types of ectotrophic mycorrhiza which, from the different characters of the mycoclena or fungus mantle, were considered to be formed by two distinct Basidiomycetes, one being a *Russula*. In both types the epidermal root cells contained the thick mycelial glomerules characteristic of the endotrophic mycorrhiza produced by Deuteromycetes of the genus *Phoma*. If it could be demonstrated that these glomerules belong—as, in the author's opinion, is probable—to a different

fungus from those forming the mantle then this would be a double type of mycorrhiza hitherto unknown.

PALM (B.). **Pinus and Boletus in the tropics.**—*Svensk Bot. Tidskr.*, xxiv, 4, pp. 519–523, 3 figs., 1931.

In the Takengon forests, Atjeh, Sumatra (1,200 m. above sea level), the writer observed the occurrence of *Boletus* (?) *pallidus* among the litter of needles of *Pinus merkusii* and also directly on the roots of the trees exposed in sandy soil by torrential rains. Examination of the material showed that the *Boletus* forms mycorrhiza as in Europe [*R.A.M.*, vi, p. 433]. The same fungus was further observed in 1925 on 10-year-old *P. merkusii* trees on the east coast of Sumatra at an altitude of 600 m. above sea level and again in 1926 in central Sumatra at an elevation of 1,400 m. On a recent tour in Guatemala a species of *Boletus* was detected under similar conditions on *P. cubensis* (1,800 m.), probably also in a symbiotic capacity although closer investigations were not made.

McARDLE (R. E.). **Determining the identity of mycorrhiza-forming fungi.**—*Papers Michigan Acad. of Science, Arts and Letters*, xiii, pp. 159–164, 1931.

Microscopic sections were made of 28 fungus fruit bodies (including Agaricaceae, *Boletus*, and *Lycoperdon*) attached directly to mycorrhizal rootlets from conifers in the Saginaw Forest, Michigan, in order to ascertain whether any real connexion exists between the fructifications and the mycelium in the interior of the roots.

The mycelium of the fruit body could not be traced in any case to the interior of the rootlets. The mycelium within the mycorrhizal rootlet and in the fungal mantle immediately around the root differed entirely in character from that composing the fruit body. These differences might possibly be due to the conditions in which the hyphae were growing but, on the whole, the author thinks that the evidence suggests that the fruit-body and the mycorrhiza are produced by two different fungi. The apparent attachment of fruit bodies to tree roots cannot be regarded as proof that the fungus forming the fructifications also produced mycorrhiza.

SATOH (S.). **Studien über die Wirkungen der durch Ophiobolus miyabeanus gebrauchten Nährlösungen auf die Keimung und Entwicklung eines anderen Pilzes.** [Studies on the effects of the media utilized by *Ophiobolus miyabeanus* on the germination and development of another fungus.]—*Mem. Coll. Agric., Kyoto Imper. Univ.*, 13, pp. 41–54, 2 graphs, 1931.

Two kinds of substances were found to be produced in the culture liquid of *Ophiobolus miyabeanus* [*R.A.M.*, x, p. 233], one accelerating and the other retarding the germination and growth of *Aspergillus niger*. The former passes through a Chamberland clay filter (F) while the latter fails to do so. When the solution is diluted, the retarding substance is more readily dispersed than the accelerating. The latter was found to be heat-resistant, while the former is easily destroyed by exposure to high temperatures.

STEVENS (F. L.). **Further observations regarding ultra-violet irradiation and perithecial development.**—*Philipp. Agric.*, xix, 8, pp. 491–499, 3 figs., 1 diag., 2 graphs, 1931.

In order to study the development of perithecia of the G 10–15 strain of *Glomerella cingulata* induced by irradiation [*R.A.M.*, x, p. 261], a sterile cover glass was placed in a sterile Petri dish and 10 c.c. of cornmeal agar poured over it. On solidification the agar was inoculated with the fungus along one edge of the buried cover glass and about 5 mm. from the edge of the latter. In three to four days the mycelium had grown out over the cover glass to a distance of 2 or 2·5 cm. The plate was then irradiated for 30 seconds, the cover glass with agar and fungus cut out, and inverted over a glass ring to form the usual van Tieghem cell. The cover glass was then ruled into millimetre squares so that repeated observations could be made of given areas under the high power of the microscope.

By means of this method it was found that the perithecia were definitely recognizable after 24 hours as hyaline, spherical bodies; after 36 hours they measured about 18 μ in diameter; after 56 hours they measured 30 to 40 μ in diameter, began to turn dark, and showed distinct reticulations. When mature they reached a diameter of 200 μ and the surface was irregularly reticulate, the meshes being 3 to 5 μ across. In both irradiated and non-irradiated regions there were two types of mycelium, one 11 μ and the other 3 μ in thickness. The perithecia may either originate in a plexus composed of a few fine hyphae meeting between two or more strands of the coarser mycelium, or they may arise directly from one or more cells of the latter. No actual evidence of fertilization has yet been seen, though suggestions of union were observed.

It was found that the lethal dosage required to kill the conidia (over 42 minutes at 75 watts) was over 300 times longer than that necessary to induce perithecial formation. Only certain cells or groups of cells (less than 1 in 500) were found to respond to irradiation.

McKAY (M. B.) & DYKSTRA (T. P.). **Potato diseases in Oregon and their control.**—*Oregon Agric. Exper. Stat. Circ.* 96, 53 figs., 2 diags., 3 graphs, 1 plan, 1930. [Received May, 1931.]

Notes are given in popular terms on the occurrence in Oregon and control of a number of well-known fungous, bacterial, and physiological diseases of potatoes. The general control measures advocated include crop rotation, seed selection and disinfection, spraying, and suitable storage conditions. A key for the identification of potato diseases is given.

REILING (H.). **Pflanzwert und Anerkennung der Kartoffel.** [Planting value and certification of the Potato.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, viii, 11, pp. 253–257; 12, pp. 285–289, 1931.

Discussing the problem of seed potato certification in Germany, with special reference to the occurrence of degeneration, the writer

advocates the establishment of a system whereby the production of potatoes for seed purposes is restricted to certain regions, e.g., Pomerania, East Prussia, and the Lüneburger Heide, where the health of the crop is generally satisfactory [cf. *R.A.M.*, x, p. 123].

MARTIN (W. H.). **Report of the seed Potato certification committee.**—*Proc. Seventeenth Ann. Meeting Potato Assoc. of America, December 30–31, 1930*, pp. 162, 165–169, 171–172, 174, 1931.

The most striking discrepancies in the regulations for potato seed tuber inspection in the different States of America and Canada are those relating to scab [*Actinomyces scabies*] and *Rhizoctonia* [*Corticium solani*]. Canada and several States, including Colorado, Montana, Nebraska, New Hampshire, Ohio, and South Dakota, allow 10 per cent. slight scab infection; Vermont 6 per cent.; California, Idaho, Michigan, New Jersey, and Washington, 5 per cent.; and Pennsylvania 3 per cent. moderate. Up to 12 per cent. slight infection by *C. solani* is permissible in California, Idaho, and Washington, and up to 10 per cent. in Canada, Colorado, Montana, Nebraska, Ohio, South Dakota, and Vermont. Some suggestions are made for revised degrees of tolerance in respect of various important diseases of certified seed.

FOLSOM (D.). **Virus diseases of the Potato.**—*Proc. Seventeenth Ann. Meeting Potato Assoc. of America, December 30–31, 1930*, pp. 83–101, 1931.

A survey is given of recent literature (1928–30) on the virus diseases of potatoes, considered under the following aspects: new and masked viruses; insect vectors and mechanical transmission and their control or prevention; effects of the environment; physiological effects in the plants and tubers; and miscellaneous data.

A five-page bibliography is appended.

STEWART (F. C.) & GLASGOW (H.). **Aphids as vectors of leaf roll among sprouting Potato tubers.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 171, 21 pp., 6 figs., 1930.

In 1928 and again in 1930 sprouting potato tubers purchased from a store in Geneva, New York, were found to be infested by the aphid *Myzus persicae R.A.M.*, ix, p. 738; x, p. 164], only once previously reported on sprouting potatoes in North America.

The results of infection experiments [which are described] confirmed those obtained by Murphy in Ireland [ibid., iii, p. 161; ix, p. 198] by demonstrating that the aphids are capable of spreading leaf roll among sprouting seed potatoes; pronounced leaf roll symptoms appeared within 35 days of planting, and 90 per cent. of the plants finally became affected. It was further shown that when one-half of an uncut, healthy, sprouting tuber was exposed for a few days to viruliferous aphids, and the other half closely covered to protect it against them, pieces of the former when planted produced affected plants, whereas pieces of the latter gave healthy plants.

Tests showed that the aphids may be destroyed without injury to the tubers if the latter are fumigated with a high nicotine tobacco powder or sodium cyanide, using at least 1 oz. of the former or 5 oz. of the latter per 1,000 cu. ft.

Seed potatoes which sprout before planting should be examined for aphids.

MARTIN (W. H.). **The relation of soil conditions to the development of Potato scab.**—*Proc. Seventeenth Ann. Meeting Potato Assoc. of America, December 30–31, 1930*, pp. 62–73, 1931.

The results [which are discussed and tabulated] of a series of observations and experiments in New Jersey on the relation of soil conditions to the prevalence of potato scab [*Actinomyces scabies*: *R.A.M.*, x, p. 12] showed that, while the disease is liable to be more severe in seasons of low moisture or high soil temperatures during the critical period for infection, the soil reaction actually determines the development of the parasite [cf. ibid., ix, pp. 671, 801; x, p. 202]. Thus, in 1921, when the disease was very severe, 59·1 per cent. of the potatoes were clean on the plots with a P_H range of 4·6 to 4·8 compared with only 5·7 per cent. at P_H 6·4 to 6·6. In the same year, 15·4 per cent. of the crop was unsaleable on the plots with an average P_H of 5·4 as against 33·3 per cent. on those at P_H 5·65, while at P_H 6·5, 94·9 per cent. was unmarketable. Some indication was obtained that the beneficial effects of sulphur are not entirely due to the increased acidity of the soil following its use, but partly also to its disinfectant action.

McLEOD (D. J.). **Potato spraying and dusting experiments in New Brunswick — 1924–1930.** — *Proc. Seventeenth Ann. Meeting Potato Assoc. of America, December 30–31, 1930,* pp. 28–36, 1931.

During six years' experiments in New Brunswick, Canada, both Bordeaux mixture (4–4–40) and copper-lime dust (20–80) produced substantial increases in yield as compared with untreated plants in Green Mountain potatoes, the former being particularly effective [*R.A.M.*, x, p. 126]. Bordeaux mixture was more efficacious against late blight [*Phytophthora infestans*] in wet seasons, but in normal years both preparations were equally good. Early blight [*Alternaria solani*] was not consistently controlled by either of the fungicides, but no significant reduction of yield resulted from this disease. The cost of the Bordeaux treatments was $11·15 per acre and that of the copper-lime dust $14·25.

MURRAY (R. K. S.). **Mycologist's Report for 1930.**—*Ninth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon), Proc. during the year 1930*, pp. 28–32, 1931.

In addition to information separately noticed from other sources [cf. *R.A.M.*, ix, pp. 673, 804; x, p. 126, and next abstract], this report contains the following items of interest concerning diseases of *Hevea* rubber observed in Ceylon in 1930.

A test made to ascertain the value of manurial treatment in the control of mildew (*Oidium*) [*heveae*], in which applications of calcium cyanamide, synthetic urea, and muriate of potash were

made in January and December, 1929, indicated that such treatment is unlikely to have any effect in localities where the disease is severe, as a careful examination of the trees made the following April showed that infection was as severe in the treated plots as in the untreated controls.

Of various materials tested for the disinfection of imported budwood and budded stumps of *Hevea* rubber against *Phytophthora palmivora* the best results were given by 1 per cent. copper sulphate solution, soaking in which for 5 minutes effectively destroyed any external infection.

MURRAY (R. K. S.). **Report on sulphur dusting experiments on Gonakelle estate.**—*Trop. Agriculturist*, lxxvi, 1, pp. 13–17, 1931.

This is a brief discussion of the results of sulphur dusting experiments in 1930 in the control of rubber mildew [*Oidium heveae*] on the Gonakelle estate in Ceylon, extending on a steep hillside from an elevation of over 3,000 feet down to about 1,500 feet. The Björklund apparatus [*R.A.M.*, x, p. 205] which was mainly used, gave entire satisfaction, with the exception of a few minor defects due to the vibration of the engine. Speaking generally, the foliage of the trees did not derive much benefit from the dustings, probably chiefly owing to the fact that the treatment was initiated too late in the season, when about 30 per cent. of the trees had already been defoliated. The dustings, however, considerably reduced the incidence and severity of the disease in the dusted plots, as compared with the control. Thus the examination of 38 trees in young leaf in the dusted field showed either total absence of the mildew or a very slight infection, with a negligible leaf fall, while 48 trees selected in the control plot in every case exhibited moderate or severe infection and a considerably greater leaf fall. A small number of trees in the dusted area which had refoliated during the operations appeared to be quite free from the disease, while, of a total of 240 trees examined, 31 per cent. showed only mild secondary attack; in the control field no entirely healthy trees were found, and the proportion with mild secondary attack was only 10 per cent. The experiments also showed that 'flotate' volcanic sulphur from Java is as effective as the American 'Acme 300' in the control of *O. heveae*, while costing in Ceylon about half the price of the latter. Finally, they indicated that it is of the utmost importance for the efficacy of the treatments to ensure that every portion of the rubber trees receives its full quota of sulphur, and not to rely on the wind to distribute the sulphur projected from a distance.

KEUCHENIUS (A. A. M. N.). **Het meeldauw-vraagstuk in Zuid-Sumatra.** [The mildew problem in south Sumatra.]—*De Bergcultures*, v, 6, pp. 148–151, 1 graph, 1931.

The writer's experiments in the control of *Hevea* rubber mildew [*Oidium heveae*] by dusting in south Sumatra are stated to confirm those obtained by Bobilioff [*R.A.M.*, ix, p. 485]. Young and half-grown leaves contracted fresh infections 12 to 14 days after the application of sulphur at the rate of 5 or 10 kg. per hect. The

period of normal leaf fall was found to extend from about the beginning of July to the end of August, the first mildew infections being observed on the new shoots about 25th July; the disease reaches a climax from about 8th to 20th August. In south Sumatra, therefore, sulphur dusting should start before this date (preferably about 16th July) and be continued at ten-day intervals until 25th August, using 10 kg. of dry Kawah sulphur or 8 kg. of 'sulphur smoke' per hect. [ibid., ix, p. 805; x, p. 56]. The estimated cost of the treatment is Fl. 1·60 to 2 per hect. for each dusting [cf. ibid., x, p. 205]. The sulphur should be applied from paths 200 m. apart, one machine being provided for every 1,000 hect. and an additional one held in reserve. The reduction in yield caused by mildew is roughly estimated to amount to between 5 and 20 per cent.

BRANDENBURG (E.). **Onderzoekingen over ontginningsziekte.** [Investigations on reclamation disease.]—*Tijdschr. over Plantenziekten,* xxxvii, 2, pp. 17–47, 4 pl., 1931.

From the roots of oat plants grown on soil at Lunteren (Holland) where reclamation disease was prevalent [*R.A.M.*, vi, p. 51; ix, p. 339], the author isolated a species of *Aphanomyces*, *Pythium mamillatum* [ibid., x, p. 293], and *P. de Baryanum.* Inoculation experiments with the first-named organism (which was also isolated from oat roots in four other areas affected with the reclamation disease) gave partly positive and partly negative results, the inconclusive character of which is attributed to faulty technique. The cortical parenchyma of the infected oat roots was found to contain large numbers of oogonia, while the central cylinder showed a marked brown discoloration. The symptoms agreed in all respects with those observed in nature. Neither *P. mamillatum* nor *P. de Baryanum* proved pathogenic to oats. The same species of *Aphanomyces* was isolated from diseased oats in North Hanover, Germany. Good control of the disease was given by soil disinfection with 0·25 per cent. uspulun (1 l. per seven-litre pot) or copper sulphate (300 mg), as well as by merely exposing the soil to the air. The plants in soil treated with 1 per cent. formalin and then dried also made excellent growth.

Fodder beets growing on 'reclamation-sick' soil were observed, in the summer of 1929, to show an exceptionally vivid green coloration of the leaves, apart from the main veins and most slender veinlets, which remained dark green. The examination of the wood vessels in the base of the tap-roots of diseased plants showed the presence of wound gum; the adjacent parenchyma cells were often brown and shrunken, while the outlying tissues and the phloem were normal. The inspection of a large number of affected beets at harvest time revealed a close connexion between the above-mentioned symptoms and the poor growth of the plants on the soils in question. Inoculation experiments [which are fully described] with pure cultures of a species of *Pythium* isolated from the diseased beets resulted in the rapid development of the typical discoloration and other symptoms. Infection was found to fall into two stages, viz., a primary one in which the fungus penetrates the root and destroys the tissue,

and a secondary injury to the leaves and wood vessels, due primarily to the toxic action of the metabolic products of the organism which are carried with the sap stream from the diseased roots through the whole plant. The filtrate of the fungus cultured in a liquid medium consisting of 1 part of Knop's solution, 1 of 1 per cent. saccharose, and 1 of 0·1 per cent. peptone, added to water cultures of fodder beets at the rate of 3, 6, 9, and 12 per cent. caused the development of symptoms of varying intensity according to the concentration. At 9 and 12 per cent. 80 to 90 per cent. of the plants showed a pronounced discoloration of the central vessels, while at 3 per cent. only 10 per cent. exhibited mild symptoms. The toxic properties of the filtrate were destroyed by 30 minutes' boiling. Further extensive field observations in Gelderland, Utrecht, Groningen, and North Brabant during 1930 revealed a complete agreement between the symptoms occurring on reclamation-sick soils in nature and those induced by inoculation. The same species of *Pythium* was isolated from diseased beets in similar soils in North Hanover. Objections having been raised to Hudig's use of the term 'Zeeuw disease' to describe the phenomenon under discussion (36e en 38e Bericht van het Rijkslandbouwproefstation, 1928 and 1929), the writer proposes the substitution of 'yellowing disease'.

Field peas (*Pisum arvense*) and broad beans [*Vicia faba*] in soils affected by the reclamation disease suffer from a similar disturbance to that described on beets. In peas the investigations were carried out in the field and in pots with soil from Lunteren, the same as that used by Smith [ibid., vii, p. 269], the disease conditions found being in general agreement with those described by Smith. The first leaves to show the yellow discoloration are those at the base of the stem, and subsequently those near the top suddenly wilt and shrivel. Affected plants are markedly stunted. Sections through the lateral roots of diseased plants show a reddish-brown discoloration of the tissues in which numerous oogonia of a *Pythium* are present. From the lateral roots the discoloration spreads to the central cylinder of the tap-root. Pea plants grown in pots filled with infected soil contracted the disease in a more severe form that those in the field, unlike oats, which suffered more severely under the latter conditions. The symptoms on *V. faba* in Lunteren are less sharply defined and more gradual in onset than on peas, and the internal discoloration is not so conspicuous. Numerous oogonia of *Pythium* sp. resembling that on peas occur in the partly or entirely dead lateral roots of this host also. The fungus isolated from diseased peas and *V. faba* was found to differ morphologically from that responsible for the yellowing of beets. Positive results were given on peas and beans by inoculation experiments with the *Pythium* isolated from them from specimens from Lunteren and also from Bittstedt in Hanover, and the fungus was recovered from the diseased roots. In the case of peas the wilting of the leaves and the discoloration of the wood vessels of the tap-root appear to be due to the toxic action of the metabolic products of the fungus, since the organism itself is restricted to the small lateral roots.

Cross-inoculation experiments with the three root parasites

showed that neither the *Aphanomyces* from oats nor the pea *Pythium* could infect beets, while the species of *Pythium* from beet and peas, respectively, failed to damage oats. On the other hand, the *Pythium* from *V. faba* produced the typical symptoms of infection on peas.

In two experimental fields in different localities where oats, barley, peas, *V. faba*, and beets were grown in adjacent plots, all the plants except the beets became diseased in one field, while in the other oats and barley were only slightly affected and the beets suffered severely. It is evident, therefore, that the different fungi associated with the reclamation disease in certain crops occur in varying ratios in different localities. The varying reaction of the plants is not compatible with Smith's theory of a substance ('gliedine') equally toxic both to oats and peas [loc. cit.], but supports the view, based on the data obtained in these investigations, that the disease is caused by distinct fungi with different biological and physiological requirements.

RADEMACHER (B.). **Erfahrungen über Auftreten und Verhütung der Urbarmachungskrankheit (Weissseuche) in Schleswig-Holstein.** [Observations on the occurrence and prevention of the reclamation disease (white disease) in Slesvig-Holstein.] —*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 2, pp. 10–13, 2 figs., 1 map, 1931.

In Slesvig-Holstein the reclamation disease of oats [the symptoms of which are described: see preceding abstract] occurs primarily on dry peat soils, though it is also found on low-lying, swampy ground. *Calluna vulgaris* is the dominant plant on the former type of soil, followed by *Erica tetralix* and various Cyperaceae, Juncaceae, and lichens. No definite correlation, however, has been traced between the reclamation disease and the peat-forming flora. The peat layer is frequently superimposed on white sand, below which is swamp ore (ironstone). The disease is particularly severe round the edges of plots where the peat has been cut. The looser the peat humus and the less mixed with sand, the more it is liable to induce the reclamation disease, which has, however, also been found on sandy peat soils with a low humus content. The hydrogen-ion concentration of a number of diseased fields ranged from P_H 5·1 to 6·9.

The term 'reclamation disease' is somewhat of a misnomer, as the disturbance has been observed by the writer to occur on soils that have been under cultivation for 80 years, and is reported to be present on land cultivated for 300 years. The damage caused by the disease on these old soils was excessively severe; in many cases no grain was formed and the oats had to be used as fodder in a green state.

In addition to dryness of the atmosphere and of the soil and to the presence in the latter of loose humus, methods of cultivation also play a part [which is briefly discussed] in the development of the reclamation disease. Good results in the control of the disease have been given by the application to the soil of 3·5 to 4·5 per cent. raphanit (L. Meyer, Mainz), which contains copper in the form of nitrate. Copper sulphate, which is reported to be very

effective in North Slesvig and Jutland, proved less satisfactory in the author's tests, but further trials are necessary definitely to determine the relative value of these two preparations.

Observations on the reaction of different varieties of oats to the reclamation disease showed that the so-called 'black' oats and *Avena strigosa* are generally tolerant, though some members of the former group, e.g., Grand Mogul, Glockenhafer, and Engelbrecht II, are subject to injury. The Oldenburg black, black and yellow peat oats (Bremen Peat Experiment Station), Dutch black President, and two Finnish strains (not on the market) appear virtually immune from reclamation disease, the first four also being resistant to grey speck [*R.A.M.*, x, p. 93] and to water shortage disturbances on normal soils (white ear) [ibid., viii, p. 304].

KOPP (A.). **Un cas de longue incubation de la mosaïque de la Canne à Sucre.** [A case of long incubation of Sugar-Cane mosaic.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xi, 113, pp. 37-39, 1931.

In Réunion mosaic of sugar-cane [*R.A.M.*, ix, p. 766] is mainly confined to one side of the island, being present only in one locality on the other side; infection appears to reach a maximum intensity at altitudes of 300 to 500 m. Nearly all the varieties grown, except P.O.J. 213, are susceptible, though M. 55, R.P. 2, R.P. 6, and Isautier take the disease in a mild form.

In November, 1929, a slight attack of mosaic developed on Batavia Guinguant canes at the Agricultural Station; these were destroyed and the nursery was reconstituted, after which no further trace of the disease appeared. Nearly six months later a few stools of Louzier parentage from a mosaic-free locality suddenly showed symptoms of the disease, although no mosaic was present in the vicinity. The disease had thus passed through an incubation period of some five months without any sign of its presence.

ROLDAN (E. F.). **Bacterial stem-rot disease of hybrid seedling Canes.**—*Science*, N.S., lxxiii, 1885, p. 186, 1931.

A preliminary account is given of a bacterial disease of hybrid sugar-cane seedlings which appeared sporadically at the College of Agriculture, Los Baños, Philippine Islands, in October, 1930. Later the same disease was observed on hybrid canes at Canlubang, Laguna, and Del Carmen, Pampanga. The foliage of affected plants turns yellow, the entire plant wilts, and under certain weather conditions the tops fall over in consequence of the rotting of the tender shoot tissues.

Cylindrical, rod-shaped bacteria with rounded ends, occurring singly or in pairs, occasionally in chains, were present in large numbers between the cells in the early stages of the disease and within them in the later ones. The bacteria measure 0·95 to 2·2 by 0·5 to 0·7 μ. No spores are formed, but capsules develop in three-day-old nutrient agar slants. The organism is motile by means of four or more peritrichiate flagella and therefore belongs to the genus *Bacillus*. It is Gram-negative and non-acid-fast. Inoculation experiments with the bacterium on healthy canes gave positive results.

WILBRINK (G[ERARDA]). **Kritiek op de voorloopige mededeeling van Dr. V. J. Koningsberger en Dr. T. H. van den Honert: over de oorzaak der z. g. kalimati-ziekte.** [Criticism of the preliminary note of Dr. V. J. Koningsberger and Dr. T. H. van den Honert: on the causes of the so-called 'kalimati disease'.]—*Arch. voor Suikerind. Nederl.-Indië,* Deel i, xxxix, 7, pp. 141–146, 1931.

The writer does not consider that Koningsberger and van den Honert have given convincing proofs of their theory that the 'kalimati disease' of sugar-cane in Java [*R.A.M.*, x, p. 408] is due to the toxic compounds arising out of the combination of ammonium and iron in the soil, and maintains her original standpoint that the condition is caused by potash deficiency.

KONINGSBERGER (V. J.) & VAN DEN HONERT (T. H.). **Nogmaals over de oorzaak der z. g. kalimati-ziekte. Antwoord op de kritiek van Mej. Dr. G. Wilbrink.** [A further note on the cause of the so-called 'kalimati disease'. Reply to the criticism of Dr. G. Wilbrink.]—*Arch. voor Suikerind. Nederl.-Indië,* Deel i, xxxix, 8, pp. 161–166, 1931.

The writers recapitulate their views on the etiology of the 'kalimati disease' of sugar-cane [see preceding abstract]. The distribution of the disease in Java does not coincide with that of potash deficiency, and the experiments previously reported showed conclusively that the toxic compounds of iron and ammonium in the soil are the basis of the trouble.

ARTHUR (J. C.). **Las royas de los vegetales (Uredinales) del Peru.** [The plant rusts (Uredinales) of Peru.]—*Estac. Exper. Agric. Soc. Nac. Agrar.*, Lima, Peru, Bol. 2, 14 pp., 1929. [Received April, 1931.]

A list is given of 83 rusts collected in Peru, mostly on ornamental plants, between 1902 and 1929. Potatoes were found, in January, 1929, to be attacked by *Aecidium cantensis* n.sp., characterized by hypophyllous, punctiform, yellowish to brown pycnidia, occurring in small circular groups; hypophyllous aecidia, crowded in circular groups, 5 to 10 cm. across, cupulate, 0·3 to 0·5 mm. in diameter; hyaline peridium with erose or lacerate, recurved margin; peridial cells rhomboidal in face view, 16 to 24 by 24 to 28 μ, oblong in side view, abutted or slightly overlapped, the outer wall 16 to 20 μ thick, smooth, the inner 2 to 3 μ thick and finely verrucose; aecidiospores angularly globoid or ellipsoid, 16 to 21 by 20 to 23 μ, with hyaline walls, 1·5 to 2·5 μ thick, much thickened above (5 to 9 μ), and minutely verrucose. *Puccinia pittieriana* [*R.A.M.*, i, p. 36] was found on the same host in February, 1929, and *P. huallagensis* on *Solanum* sp. in 1903. Indexes of fungi and hosts are appended.

HIRAYAMA (S.). **Studies on septorioses of plants. IV. New or noteworthy species of Septoria found in Japan.**—*Mem. Coll. Agric., Kyoto Imper. Univ.*, 13, pp. 33–40, 2 pl., 4 figs., 1931.

Critical and taxonomic notes are given on ten species of *Septoria* recently studied by the author near Kyoto, Japan. Four of the

species are new to science, and these are furnished with Latin diagnoses. None appears to be of economic importance.

STEVENS (F. L.). **A misnomer in the use of the term sooty mold.**—*Philipp. Agric.*, xix, 8, p. 549, 1931.

The application of the term 'sooty mould' (French 'fumagine') to members of the genus *Meliola* is deprecated. The common fungi, *M. citri*, *M. camelliae*, and *M. penzigi* [*R.A.M.*, iii, p. 211; v, p. 549; viii, p. 405] should probably be transferred to the genera *Capnodium* or *Limacinia*, and in any case they should be excluded from *Meliola*, which possesses none of their distinctive characters.

HENDERSON (R. G.). **Transmission of Tobacco ring spot by seed of Petunia.**—*Phytopath.*, xxi, 2, pp. 225–229, 2 figs., 1931.

Wingard has shown [*R.A.M.*, viii, p. 139] that garden petunias (*Petunia violacea*) are susceptible to artificial infection by tobacco ring spot, but natural infection on this host has only recently been observed in Virginia. Out of 810 petunia seedlings grown under carefully controlled conditions from seed collected in August, 1929, from plants inoculated with the tobacco ring spot virus, 160 or 19·8 per cent. developed ring spot infection, and inoculation with this material gave positive results on tobacco. The diseased seedlings were severely dwarfed, the first few leaves were mottled and streaked with watery green spots and lines more or less following the veins, and some curling of the leaf margins was also observed. Later nearly all these symptoms became masked, but some leaves continued to show streaks and many developed the chlorotic and necrotic rings typical of systemic infection. Out of 104 seedlings raised in the spring of 1930 from a portion of the above-mentioned seed kept in storage over winter, 21 exhibited ring spot symptoms.

DUFRÉNOY (J.), SAREJANNI (J.), & CRISTINICI. **Taches bactériennes du Tabac.** [Bacterial spots of Tobacco.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, x, 111, pp. 861–867, 1 pl., 4 figs., 1930.

This is a brief account of the wildfire disease (*Bacterium tabacum*) of tobacco and of its distribution in different parts of the world. Its control is also briefly discussed.

Outbreak of downy mildew ('blue mould') of Tobacco.—*Journ. Dept. Agric. Western Australia*, 2nd Ser., vii, 4, pp. 614–615, 1930.

In connexion with the outbreak of downy mildew or blue mould [*Peronospora* sp.] recently reported from Western Australia [*R.A.M.*, x, p. 134] the attention of farmers and tobacco growers is directed to two regulations contained in the *Government Gazette* of the 24th October, 1930, the first of which prohibits the sale or distribution within that State of tobacco seeds without previous inspection and adequate disinfection under supervision, while the second prohibits the introduction into Western Australia of tobacco plants or seeds, save for the use of the Department of Agriculture.

Szembel (S. J.). Несколько слов о болезнях Томата в Астраханском Округе. [A few notes on Tomato diseases in the district of Astrakhan.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 32–34, 1930. [German summary.]

Tomatoes are stated to be the main truck crop in the district of Astrakhan, where the production in 1929 attained 75,000 tons. The following are the chief parasitic diseases of the crop recorded in that region (in the order of their seasonal appearance). Bacteriosis of the fruits (*Phytobacter lycopersicum*) [*R.A.M.*, viii, p. 152], the spots of which are usually invaded subsequently by *Macrosporium lycopersici* [ibid., vi, p. 132] and *Fusarium erubescens* [ibid., vi, p. 336]. Melanose (*Septoria lycopersici*) [ibid., viii, p. 342] occurs both in seed-beds and in the field and causes a wilt of the plants. Leaf curl (the etiology of which and its relationship to mosaic are being investigated) of recent years has attained an epidemic extension in the district, especially on the variety Mikado; in severe cases the leaves assume a thread-like appearance, and the fruits do not develop and become woody [see next abstract]. Mosaic is also widespread, and there is some evidence that it may be distributed by the mite *Tetranychus telarius* sensu lato. Tomato wilt caused by *Bacillus* [*Bacterium*] *solanacearum* [ibid., ix, p. 210] is of rarer occurrence, but it sometimes kills a large percentage of the plants in certain localities.

Stepanoff (K. M.). Некоторые наблюдения над скручиванием листьев Томатов в Астраханском Округе. (Предварительное сообщение). [Some observations on the curling of Tomato leaves in the district of Astrakhan. (Preliminary communication.)]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 41–54, 1930. [German summary.]

After briefly describing the symptoms of the tomato leaf curling which has recently become widespread in the district of Astrakhan [see preceding abstract], and which in its main features closely resembles a similar condition described by Güssow from America (*Phytopath.*, xi, 9, pp. 380-383, 1921), the author gives details of experiments and field observations in 1927 to 1929 for the purpose of determining the external factors that govern the incidence of the trouble, and the relative resistance to it of different varieties, some sixty of which were tested. In agreement with the results of Güssow, it was found that the disease almost exclusively occurs in tomato plants that are pruned down to one stem and staked; in plants allowed to grow under their natural habit and to spread out over the ground, the trouble is very rarely present, and then confined to the lower leaves only. No attempt was made to determine the cause of the disease, but the evidence so far collected would indicate that it is either due to a virus or to physiological disturbances caused by the unnatural habit of growth imposed by cultivation, especially the reduction in leaf surface. Excessive irrigation and manuring appeared to increase the incidence of the leaf curling.

All the tomato varieties tested proved to be susceptible, the differences between them being only in degree. The least affected

group included the varieties Marvel of the Market, Best of All, Juwel, and Spark's Earliana, while Pierretta and Ficarazzi were among the most heavily diseased. Leaf curling did not seem, however, to affect either the yield or the quality of the crop.

BUBENTZOFF (S. T.). О поражении плодов Томата бактериозом. [Bacterial infection of Tomato fruits.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 35–40, 1930. [German summary.]

Field observations in the district of Astrakhan in 1928 indicated that early sown early varieties of tomatoes suffer considerably more from bacteriosis of the fruits [*Phytobacter lycopersicum*: see previous page] than later maturing ones, a fact which is apparently related to the high air temperature and dryness which prevail at the time when the tomatoes ripen. The same early varieties, when sown later in the season, assumed the habit of late varieties and were comparable with the latter in their relative resistance to the disease. A high content of common salt in the soil, such as is found in some localities on the right bank of the Volga, seemed to predispose the tomato plants to bacteriosis, since in some of these places the whole of the crop was infected.

SANDER (O.). **Zur Sklerotienkrankheit der Tomaten.** [On the sclerotial disease of Tomatoes.]—*Obst- und Gemüsebau*, lxxvii, 2, p. 36, 1931.

The writer states that he first observed the sclerotial disease of tomatoes, caused by *Sclerotinia libertiana* [*S. sclerotiorum*], in Germany about ten years ago [cf. *R.A.M.*, v, p. 59; x, p. 212], the Danish Export variety being particularly susceptible. The fungus also occurs in a destructive form on carrots [ibid., vii, p. 786; viii, p. 591], and the location of tomato beds near the latter should therefore be avoided. The symptoms of the disease and the factors predisposing to infection are briefly discussed.

MARTINEZ (J. B.). **Hongos parásitos y saprofitos de las plantas leñosas de España (1ª nota).** [Parasitic and saprophytic fungi of the woody plants of Spain (1st note).]—*Bol. R. Soc. Española Hist. Nat.*, xxxi, 1, pp. 39–44, 2 figs., 1931.

Helostroma album [*R.A.M.*, vii, p. 407], found on living leaves of oak (*Quercus toza*) at El Escorial, Madrid, in August, 1930, is stated to be a new record for Spain. The systematic position of the genus is doubtful. The hypostroma is reminiscent of the Melanconiales, but the coremium appears more characteristic from the systematic standpoint, and suggests a position amongst the Stilbaceae. The closely related *Microstroma album*, believed by Saccardo to be the imperfect form of *H. album*, which he regarded as belonging to the Hymenomycetes, has not yet been found in Spain.

SASTRI (B. N.) & NARAYANA (N.). **The spike-disease of Dodonaea viscosa.**—*Journ. Indian Inst. Sci.*, xiiiA, 12, pp. 147–152, 1931.

The results [which are tabulated and discussed] of determina-

tions of the non-protein nitrogen constituents of the tissues of healthy *Dodonaea viscosa* trees and those suffering from spike disease in Mysore showed that the nitrate, nitrite, ammonia, and amide contents of the latter were consistently higher than those of the former. As in the case of spike-diseased sandal [*Santalum album*: *R.A.M.*, ix, p. 277], sugars and starch tend to accumulate in the affected tissues, the diastatic activity of which is also higher than that of healthy ones. Both in *D. viscosa* and *Zizyphus oenoplia*, which is liable to a similar disease, the abnormal condition is further characterized by deficiency of calcium.

SMITH (C. O.). **Pathogenicity of Bacillus amylovorus on species of Juglans.**—*Phytopath.*, xxi, 2, pp. 219–223, 10 figs., 1931.

During the period from 1927 to 1930 the writer carried out a series of inoculation experiments at Riverside, California, with *Bacillus amylovorus*, isolated from pear and *Cotoneaster*, on various species of walnuts, the susceptibility of which to artificial infection by this organism was first demonstrated by M. C. Goldsworthy about 1926. Positive results were obtained on *Juglans californica*, *J. hindsii*, *J. major*, *J. nigra*, *J. sieboldiana*, *J. sieboldiana* var. *cordiformis*, and the hybrids *J. hindsii* × *J. regia*, *J. californica* × *J. regia*, and *J. nigra* × *J. regia* (Royal hybrid). The dark lesions, 10 to 20 mm. in diameter, formed on the epidermis of the succulent shoots and on the nut shells, were indistinguishable from those of *Bacterium juglandis* [*R.A.M.*, ix, p. 567]. So far *B. amylovorus* has not been observed to occur on *J. regia* under natural conditions.

WESTENBERG (J.). **La maladie de l'Orme en Auvergne.** [The Elm disease in Auvergne.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 2, pp. 24–28, 1 fig., 1931.

Dutch elm disease (*Graphium ulmi*) [*R.A.M.*, x, p. 277], a brief account of which is given in semi-popular terms, was noted by the author in August, 1930, at St. Nectaire and Besse in Auvergne. From specimens sent to Baarn, Prof. Westerdijk isolated *G. ulmi* in pure culture. The infections appeared to be very recent.

ARNAUD (G.) & BARTHELET (J.). **La maladie de l'Orme.** [The Elm disease.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 2, pp. 28–32, 1 pl., 1 fig., 1931.

Referring to the first reported appearances and early spread of Dutch elm disease (*Graphium ulmi*) [see preceding abstract] in Europe, the authors state that an avenue of elms at Montpellier died off as early as 1910, the trees showing symptoms identical with those of infection by *G. ulmi*. To-day the disease is widely prevalent and severe in the vicinity of Versailles where the authors have studied it. A brief description is given of the symptoms and of the morphology of *G. ulmi* in pure culture. Attention is called to the natural affinity of this fungus to the genus *Verticillium*. Bacteria were not concerned in the causation of the disease as seen by the authors, nor was the *Scolytus* beetle found by them in a young tree invaded by *G. ulmi* [cf. *R.A.M.*, x, p. 348].

Baxter (D. V.). **The fungi and the decay of the American Chestnut: part I.**—*Papers Michigan Acad. of Science, Arts and Letters*, xiv, pp. 259–290, 18 pl., 4 figs., 1 map, 1931.

In comparison with many closely related hardwoods, the American chestnut (*Castanea dentata*) is fairly free from infection by wood-destroying fungi. However, the relatively few species that do occur are generally prevalent throughout the entire range of the tree, comprising the Adirondacks, New England, the Alleghanies, the southern Appalachians, parts of Alabama, and Michigan.

Full particulars, accompanied by tables, are given of a number of Hymenomycetes found growing on the sapwood and heartwood of dead (and in some cases also of living) chestnut trees, emphasis being laid on the importance of the organisms as agents of decay in structural timber.

Baxter (D. V.) & Strong (F. C.). **Chestnut blight in Michigan.**—*Michigan Agric. Exper. Stat. Circ. Bull.* 135, 18 pp., 8 pl., 1931.

Notes are given on the occurrence of chestnut blight (*Endothia parasitica*) [*R.A.M.*, x, p. 276] in Michigan, where infection is now stated to have spread throughout the entire range of the native chestnut in the south-eastern part of the State. So far the fungus has not been reported in the valuable chestnut stands of the south-west, but it occurs at Bristol, Indiana, within six miles of the Michigan boundary line. Over 2,000 seedlings of the resistant *Castanea mollissima* and *C. crenata* have been planted near Ann Arbor, and others in the south-west. No evidence has yet been given of the development of any appreciable degree of resistance to blight by any native chestnuts.

Rayner (M. Cheveley). **Observations on Armillaria mellea in pure culture with certain conifers.**—*Forestry*, iv, 2, pp. 65–77, 2 pl., 1930.

The experiments described in this paper consisted in growing Corsican pine (*Pinus laricio* var. *corsicana*) and Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] seedlings, raised from surface sterilized seed, in pure culture on sterilized sand irrigated with a synthetic nutrient solution [the composition of which is given], in the presence of small pieces of rhizomorphs of *Armillaria mellea* obtained in pure culture on malt agar from isolations from young sporophores. In this medium rhizomorphs continued to form freely, but in the sand cultures the pieces of rhizomorphs used as inoculum, under the conditions of the experiment, continued to grow as mycelium, but were never seen to form fresh rhizomorphs. The seedlings of both species enjoyed a long period of immunity (8 to 12 months), and their behaviour indicated a relatively high degree of resistance which, however, was easily impaired by unfavourable factors in the environment. When attacked, the seedlings reacted by thickening and suberization of the cell walls and rapid formation of cork, resulting after a year or more in the appearance of stem and root 'cankers' at the points of attack, which were finally sloughed off. These corky cankers,

which resembled ordinary lenticels, contained the mycelium of the fungus, penetration at the point of emergence of the lateral roots taking place either by isolated hyphae or by branches from a closely adpressed sheet of xylostroma. At the base of the stem the cankers were large and rough, with considerable masses of corky tissue. In the Corsican pine, attack on the roots was greatest at the point of emergence of lateral roots and each seemed to represent a separate focus of infection. Corresponding pot cultures of both species were grown for three years without showing any signs of infection, and remained quite free from cankerous lesions.

The paper terminates with a discussion of the bearing of the results of the experiments on the inconsistencies of the attack of conifer trees by *A. mellea* which are observed in the field. In agreement with Day [*R.A.M.*, vi, p. 197], the author considers that control of *A. mellea* in the field is bound up with the provision of optimum environmental conditions, thus permitting the maximum development of the naturally high powers of resistance inherent in the hosts.

[A short abstract of this paper is published in the *Report of the 98th meeting of the British Association for the Advancement of Science*, p. 411, 1930.]

BAXTER (D. V.). **A preliminary study of Coleosporium solidaginis (Schw.) Thüm. in forest plantations in the region of the Lake States.**—*Papers Michigan Acad. of Science, Arts and Letters*, xiv, pp. 245–257, 6 pl., 1931.

The most common fungous parasite of red pines (*Pinus resinosa*) in the Lake States is *Peridermium acicolum*, the aecidial stage of *Coleosporium solidaginis* [*R.A.M.*, v, p. 252], which may cause severe damage in young stands by retarding height development and injuring the needles on the lower branches. In a similarly stocked stand consisting of trees of approximately the same age, infection occurred in varying degrees of severity on different sites. Thus, none of the pines growing near black locust [*Robinia pseudacacia*] trees was badly damaged by the rust, possibly on account of the stimulus to height given by proximity to the locusts. The highest incidence of infection was observed on the much shorter pines growing at a distance from the locust trees. There were 14·4 alternate host plants (*Solidago* sp.) per one metre quadrat under the red pines on the site near the locusts and 33·2 under those situated at a distance.

Young western yellow pine (*Pinus ponderosa*) in the same stand was also attacked by the rust which, although originally described as occurring on this species (*Phytopath.*, xviii, p. 309, 1918), has not since been reported on it. According to Weir, the aecidial material on which the description was based was actually found on *P. contorta*. Older western yellow pine trees were not attacked, and it is considered probable that little or no damage is inflicted by the rust after the lower needles begin to fall.

Species of *Aster* are reported as alternate hosts of *C. solidaginis*, but they were not infected in the Saginaw Forest.

FRITZ (E.) & BONAR (L.). **The brown heart-rot of California Redwood. Part I. Notes on the development of the causal fungus. Part II. The etiology of the causal fungus.**—*Journ. of Forestry*, xxix, 3, pp. 368–380, 2 pl., 1931.

In the first part of this paper E. Fritz records the recent detection, in Humboldt County, California, of the sporophores of the fungus causing the common brown heart rot of California redwood (*Sequoia sempervirens*), and in the second part L. Bonar gives a technical description of the organism under the name of *Poria sequoiae* n. sp. and discusses its etiology in relation to the decay.

The brown heart rot, which is responsible for a loss of 12 to 15 per cent. of the gross total of potential lumber from this species, occurs primarily on the lowest section of the trees, gaining entrance through fire scars or other wounds. The infected wood is reduced to pockets of a deep brown, charcoal-like 'dry rot', which cracks and forms rough cubes on exposure and drying. The pockets may measure up to several inches across and eight or more inches in length. They are usually thinly distributed in a central basal cone of discoloured wood, generally under 20 ft. but sometimes exceeding 40 ft. in height, situated well within the outer limits of the heartwood. In the final stages of the disease the pockets constitute an almost continuous mass of rot. While they are still separated the intervening wood remains firm but is discoloured and in the incipient stages of decay. Microscopic examination reveals the presence of numerous hyphae in the affected zone. Mycelial growths resembling a light bloom are often found on the surfaces of the deep brown cubes of advanced rot. Occasionally sheet-like mycelial felts, 4 ft. or more long, 4 inches or more in width, and $\frac{1}{16}$ to $\frac{1}{8}$ inch thick, are found in the central 'rift cracks'. Fluffy mycelial growth in the cracks of the dry cubes of rot is common.

The snow-white, resupinate sporophores have been found in hollow butts, in rift cracks, and on log ends where the logs lie very close together, end to end. They require moderately low, even temperatures and high relative humidity for their development, and are readily disintegrated by moulds, e.g., *Penicillium* spp., following soaking rains. It is evident, therefore, that *P. sequoiae* can only produce sporophores under infrequently occurring combinations of favourable conditions. In practically all the cases of heart rot examined, numbering several hundred, fire scars were found to be the precursors of infection. Some of the fires were found to date back over 1,000 years, and it was obvious that several occurred during each century. In 1923 the writer found that young trees (64 years old), many of them originating as sprouts or suckers from badly decayed trees, were infected by the brown heart rot wherever they had been injured by fire.

A dry rot, closely resembling the heart rot described above, was found in the thick outer bark of thirty or more large redwood trees. So far, however, it has not been possible to trace any connexion between the two types of decay.

The margin of the sporophore consists of a sterile zone, 1 to 2 mm. wide, closely appressed; the white subiculum averages 0·25 to 0·5 mm. in thickness; the pores, up to 3 or 4 mm. long in a

vertical position, are white when fresh, turning light buff in dried specimens; the circular to oval, glabrous mouths number on an average 4 to 5 per mm.; the 4-spored basidia measure 12 to 15 by 5 μ, and the ellipsoid, smooth, hyaline, apiculate spores 4·5 to 6 by 2 to 3·5 μ; paraphyses are abundant but there are no cystidia; the tramal hyphae are 2·5 to 3·5 μ in diameter; clamp-connexions occur in the tissue of the subiculum. A close resemblance exists between *P. sequoiae* and *P. ornata* (Peck) Sacc. (*Polyporus ornatus* Peck: *Thirty-eighth Rept. New York State Mus.*, p. 92, 1885), but the differences in morphology and habit [which are briefly outlined] between the two organisms are considered sufficient to justify the establishment of a new species.

A detailed account is given of laboratory experiments in which pure cultures of *P. sequoiae*, obtained from aseptically removed fragments of the internal rotted tissues, were inoculated into sterilized blocks of redwood with positive results, the fungus being reisolated from the infected material, on some of which it developed small sporophores of a *Poria* with pores, basidia, and spores exactly agreeing with those found in nature, while the others formed sterile atypical sporophores. The rot produced in the wood blocks also agreed in its general characters with that observed in the standing trees. It is apparent, therefore, that the brown heart rot of *S. sempervirens* is caused by the newly discovered fungus, *P. sequoiae*.

WALKER (J. C.). **Onion diseases and their control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1060, 24 pp., 16 figs., 1931.

Popular notes are given on the symptoms, etiology, effects, and control of the following diseases of onions in the United States, together with a descriptive key for their prompt recognition; smut (*Urocystis cepulae*), mildew (*Peronospora schleideni*) [*R.A.M.*, ix, p. 426; x, p. 219], leaf mould (*Macrosporium parasiticum*) [loc. cit.], purple blotch (*M. porri*), pink-root (*Phoma terrestris*) [ibid., ix, p. 621], rust (*Puccinia porri* and *P. asparagi*) [ibid., x, pp. 153, 288] on the Egyptian onion (*Allium cepa* var. *bulbellifera*), white rot (*Sclerotium cepivorum*) [ibid., ix, p. 356], yellow dwarf [ibid., x, p. 429], neck rot (*Botrytis* spp.), soft rot (*Bacillus carotovorus* and other species), black mould (*Aspergillus niger*), and smudge (*Colletotrichum circinans*) [ibid., ix, p. 759], the last four being primarily storage and transit diseases.

FOËX (E.), DUFRÉNOY (J.), & LABROUSSE (F.). **La maladie des Épinards.** [The Spinach disease.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 7, pp. 216–218, 1931.

Since the beginning of 1930 observations have been made in various parts of France, including the environs of Paris, on a spinach disease characterized by a stunting, crinkling, thickening, and yellowish to greenish or yellowish-white discoloration of the heart leaves, followed by wilting and death, with or without rotting of the foliage, collar, and tap-root. In severe cases the leaves may be reduced to one-fifth of the normal size. The disease is most prevalent on spinach sown in August, and is believed to be favoured by extreme humidity, an excess of organic manu

and synthetic nitrogenous fertilizers, and repeated cultivation of the crop on the same site. The mycelium of a fungus, which has been identified in pure culture as *Pythium ultimum* [*R.A.M.*, vii, p. 2], has been detected in the collar, petioles, and leaves of infected plants. The same organism was recently isolated from a yam [*Dioscorea* sp.] tuber from Seine-et-Marne.

CLAYTON (E. E.). **Cucumber disease investigations on Long Island.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 590, 20 pp., 5 figs., 1931.

Investigations [which are briefly described, and the results of which are tabulated] into the control of the chief diseases of cucumbers on Long Island, viz., wilt (*Bacillus tracheiphilus*) [*R.A.M.*, viii, p. 294], downy mildew or blight (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [ibid., x, p. 437], and mosaic showed that although none of these diseases is seed-borne [but cf. ibid., ix, p. 735 for mosaic], seed treatment with semesan jr. dust by protecting the seed from decay improved the stand; this dusting is recommended for all seed planted before the soil is warm.

Spraying against the cucumber beetle [*Diabrotica vittata*] during the six weeks after sowing also controlled *B. tracheiphilus* [cf. ibid., vii, p. 72], the best results being given by kayso-calcium arsenate 3–3–50, which, further, had an excellent effect on plant growth. Bordeaux mixture caused stunting and reduced the early yield.

Spraying against *P. cubensis* should begin, in Long Island conditions, at the end of July, Bordeaux mixture 3–4–50 being used for the first three applications and 6–8–50 subsequently. As a rule, the plants should be sprayed twice a week until the end of September, after which treatments may be less frequent.

The only possibility of controlling mosaic, the chief cause of the decline of the cucumber crop on Long Island, lies in the development of resistant varieties [ibid., viii, p. 352; ix, p. 427]; the prospects of succeeding in this are now regarded as highly encouraging.

There is a bibliography of 18 titles.

SZEMBEL (S. J.). **О лечении мучнистой росы на Огурцах мышьяковокислым натром.** [Control of powdery mildew of Cucumbers by means of disodium hydrogen ortho-arsenate.]—*Comment. Inst. Astrachanensis ad defensionem plantarum*, ii, 4, pp. 21–31, 1930. [German summary.]

After referring to the importance of the cucumber crop in the district of Astrakhan (where some 700 hectares were occupied by it in 1929), the author states that one of its most destructive diseases in the field (but not under glass) is powdery mildew, which frequently reduces the yield by 75 per cent. or more. The causal organism is found only in the *Oidium* '*erysiphoides*' stage and it has not been possible so far to determine which of the two species, *Erysiphe cichoracearum* and *Sphaerotheca* [*humuli* var.] *fuliginea*, recorded on cucurbits [*R.A.M.*, vii, p. 273] is concerned.

Other parasitic diseases of cucumber recorded include anthracnose (*Colletotrichum lagenarium*) [ibid., ix, p. 759], spotting (*Sporodesmium mucosum* var. *pluriseptatum*) [ibid., v, p. 70], bacteriosis (*Bacillus burgeri* Potebnia) [*Bacterium lacrymans*] usually associated with *Scolecotrichum melophthorum* [*Cladosporium cucumerinum*: ibid., vii, p. 6; x, p. 76], white leaf spot (*Phyllosticta cucurbitacearum*) [ibid., ix, p. 287], an undetermined species of *Fusarium* on the fruits, and mosaic.

In experiments on the control of powdery mildew in 1929 [details of which are given] the best results by far were obtained with sodium arsenate spray (Na_2HAsO_4), which caused no scorch injury to the plant. Sodium arsenite (Na_2HAsO_3), on the other hand, caused severe leaf scorch [cf. ibid., vii, p. 41]. The sodium arsenate solution was equally effective at concentrations ranging from 0·5 to 2 gm. to 12 l. water, and whether applied before or after the development of external symptoms. In most cases the mildew was entirely suppressed. Experiments by other workers in Russia indicate that sodium arsenate is also effective against American mildew (*Sphaerotheca mors-uvae*) of gooseberry, and apple mildew (*Podosphaera leucotricha*).

Bordeaux mixture gave very contradictory results, while sodium carbonate caused severe leaf scorch. Sulphur dust controlled the mildew only in places where the dusted leaves were exposed to direct sunlight, but not in shady places or on the under side of the leaves. No absolute immunity from the disease was observed in the varieties of cucumber tested; the local Galakhovski and Muromski varieties were the most susceptible, and a Japanese [unnamed] climbing variety showed the highest relative resistance.

WEST (E.). **Peanut rust.**—*Plant Disease Reporter*, xv, 1, pp. 5–6, 1931.

Rust of groundnuts caused by *Bullaria arachidis* (Speg.) Arthur & Mains [*Puccinia arachidis*: *R.A.M.*, v, p. 215] was detected in the uredinial stage on 15 plants in an experimental greenhouse and 9 in an adjacent plot at Gainesville, Florida, in October, 1930. Three species and one hybrid were infected, viz., *Arachis hypogaea*, *A. nambyquarae*, *A. prostrata*, and *A. hypogaea* × *A. nambyquarae*. The fungus is believed to have been introduced from Brazil on seeds of two of the species. The last previous report of the disease in the United States was in 1921, also in Florida. The recent outbreak is thought to have been completely suppressed by the eradication of the affected plants and thorough disinfection of the sites.

MORUZI (CONSTANCE). **Sur une maladie du Champignon de couche causée par un Monilia.** [On a disease of the Mushroom caused by a *Monilia*.]—*Bull. Soc. Myc. de France*, xlvi, 2, pp. 143–148, 4 figs., 1930.

Agaricus [*Psalliota*] *campestris* growing in commercial beds in France was attacked by a virulent red mould which in culture developed numerous chains of reddish conidia, averaging 16 by 11 μ, and brown bulbil-like tubercles which the author regards as

abortive perithecia. The vegetative hyphae obtained in pure cultures, which closely resembled those of *Monilia sitophila* [*R.A.M.*, ix, p. 531], were cylindrical, branched, and septate, with numerous anastomoses. In general appearance the fungus was also similar to *Neurospora tetrasperma*, like which it was homothallic. It is provisionally identified with *M. sitophila*.

NEYRAC. **Exposé des traitements contre le mildiou en Charente.** [An account of control measures against mildew in the Charente.]—*Prog. Agric. et Vitic.*, xciv, 52, pp. 613–619, 1930.

The author states that in 1930 climatic conditions in the department of Charente [south-west France] were very favourable to the development of vine mildew [*Plasmopara viticola*: *R.A.M.*, x, p. 154]. A review of the varying degree of control of the disease attained by different growers leads to the following general conclusions. In years of severe outbreaks of *P. viticola* the whole question of control hinges on the degree of protection afforded by the sprays against invasion of the leaves by the fungus. The type of apparatus used is of less importance than the method of handling. In general, in small holdings and where the number of sprayings is reduced to a minimum owing to financial considerations, the knapsack type of sprayers which 'wash' rather than 'spray' the stocks, is to be recommended. Too fine sprays which deposit small, spaced droplets on the leaves are not as efficacious as heavier sprays which cover the leaves with a continuous film of the liquid, and the efficacy is still increased by the addition of spreaders. There is a minimum in the expenditure of spray material per unit area (10 hl. to the hectare in the Charente) below which the efficacy of the spray rapidly drops off. Home-made Bordeaux mixture at a concentration of 3 per cent. and over gave considerably better control than the ready-made commercial mixtures (the guaranteed metallic copper content of which is not over 16 per cent.), except when used at doses higher than those given in the instructions. The sprays are only useful against attacks of *P. viticola* on the leaves, and the attacks on the grape bunches can only be controlled by applications of cupric dusts intercalated between the sprays. The best results in dusting were obtained by the author with a mixture of two-thirds cupric sulphur and one-third of one of the commercial Bordeaux mixture powders. Very early spraying of the vines in the spring is considered to be a good insurance against a heavy outbreak of the disease later in the season [ibid., x, p. 358].

LEPAGE (E.). **Le mildiou en Anjou en 1930.** [Mildew in Anjou in 1930.]—*Prog. Agric. et Vitic.*, xcv, 3, pp. 65–69, 1931.

A brief account is given of the varying degree of success obtained in the control of vine mildew [*Plasmopara viticola*] in Anjou in 1930, the observations indicating that, in years of heavy outbreaks of the disease like that under review, the treatment must consist of one spraying per week with Bordeaux mixture not below 2 per cent. concentration and two dustings with cupric sulphur, in order to obtain a clean crop.

ROZIER (A.). **Le black rot.** [Black rot.]—*Rev. de Vitic.*, lxxiv, 1905, pp. 5–10; 1906, pp. 21–25; 1907, pp. 37–40; 1908, pp. 53–56; 1909, pp. 69–71, 1 col. pl., 1931.

In this historical survey of the appearance, spread, and rapid conquest of black rot of the vine (*Guignardia bidwellii*) in France, the author states that the disease first appeared at a few scattered points in the early 'eighties, but by 1895 had become widely prevalent throughout the south-west, where in some localities the yield was reduced by over 90 per cent. and many vineyards were abandoned. The same year a meeting was convened by Viala, who gave it as his opinion that *G. bidwellii* could be controlled by five applications at specified times of 3 per cent. neutral Bordeaux mixture. Further official tests were carried out and further conferences held, culminating in an inter-departmental congress at Bordeaux in December, 1896, at which Foëx expressed the conclusions he had reached as to the practicability of control measures. These, which in broad outline agreed with those of the other investigators, stressed the value of neutral Bordeaux, Burgundy, or copper acetate mixtures and emphasized the necessity for making the applications at the proper times. Wherever these recommendations were adopted good results at once followed, the loss in one vineyard, for example, falling from 100 to 10 per cent. in the first year. Since then, control has continued much along the same lines, with the result that black rot is now so rare in France as to have lost all economic importance.

MARCHAL (E.). **Belgium: short account of crop disease conditions in 1930.**—*Internat. Bull. of Plant Protect.*, v, 3, pp. 37–38, 1931.

In all the specimens of 'scorched' flax examined from Flanders *Asterocystis radicis* [*R.A.M.*, x, p. 14] was present, while no species of *Pythium* were found. It would appear, therefore, that various root parasites may be implicated in the causation of scorch in different countries, e. g., *A. radicis* in Belgium and *P. megalacanthum* in Holland [ibid., vii, p. 578].

A bacterial disease of tobacco very similar to wildfire [*Bacterium tabacum*] was observed in the Semois Valley.

Chicory [*Cichorium intybus*] in the Gembloux district was affected by a disease of the mosaic type.

A fungus believed to be identical with *Corticium concentricum* was responsible for a curious disease of gooseberries.

[SHEPHERD (E. F. S.).] **Mycological Division.**—*Ann. Rept. Mauritius Dept. of Agric. for the year 1929*, pp. 8–11, 1931.

Owing to the fact that the susceptible White Tanna variety of sugar-cane occupies more than half the total area sown to this crop in Mauritius, leaf scald (*Bacterium albilineans*) [*R.A.M.*, ix, p. 507] still remains the most important disease of sugar-cane in the island. In an attempt to propagate disease-free material, nurseries planted with White Tanna cuttings selected from apparently healthy stools were established on two estates as well as at

the Central Experiment Station, but the extreme prevalence of scald on White Tanna renders it unlikely that the establishment of nurseries from apparently healthy stools will free this variety from the disease. It was shown that a moderate degree of scald reduced the sucrose content of the cane by 10·1 per cent.

Gummosis (*Bact. vascularum*), which attacks a greater number of sugar-cane varieties than does scald, generally causes only leaf infections in Mauritius, but very susceptible varieties, such as the Mauritius seedling 55/1182, show many stem infections, with resultant serious losses.

A plot laid down in 1928 to test the effect of streak on sugar-cane [cf. ibid., ix, p. 679] was reaped towards the end of 1929, when it was ascertained that the yield of the affected cuttings was 44 per cent. less than that of healthy ones. No evidence was obtained that streak is transmitted from diseased to healthy stools.

The term 'stem deterioration' is applied to an affection characterized at first by yellowish patches at or near the centre of the stem, which later turn reddish-brown; in advanced stages they cause the stem to become hollow.

A collar rot of tobacco, closely resembling the black shank described from other countries [*Phytophthora nicotianae*] was recorded for the first time in Mauritius in 1929. The disease chiefly attacks some of the newly imported Virginian varieties, and several plantations have sustained serious losses from it. A species of *Phytophthora* was found in freshly diseased material.

The chlorosis of maize most commonly present in Mauritius is believed to be stripe [cf. ibid., ix, p. 300], though there was some evidence that streak [ibid., ix, p. 765] is also present.

Mosaic was recorded on *Physalis peruviana*, cucurbits, and *Brassica sinensis* [? *B. pekinensis*]. Other records included cigar end rot [ibid., ix, p. 256], associated with a *Verticillium*, on Dwarf bananas (*Musa cavendishii*), a wilt of undetermined cause on the same host, and leaf spot (*Bact. betle* associated with a *Cercospora*) of betel vine (*Piper betle*).

A year's service of research in laboratory, barn and field.— *Forty-seventh Ann. Rept. Wisconsin Agric. Exper. Stat. for year ended June 30, 1930* (*Bull.* 420), 137 pp., 44 figs., 2 diags., 1 map, 1931.

The following references of phytopathological interest, other than those noticed from different sources, occur in this report. Considerable yellowing and dropping of apple leaves were found by G. W. Keitt and other workers to result from the application of lime-sulphur 1 in 40 against scab [*Venturia inaequalis*] on 21st and 31st July, and the same preparation at a strength of 1 in 60 or dry lime-sulphur 3 in 50 are recommended as substitutes. In controlled greenhouse experiments protection from various sulphur dusts and wettable sulphur preparations broke down after comparatively little washing, whereas lime-sulphur 1 in 40, with or without lead arsenate, withstood washing much better [*R.A.M.*, ix, p. 510]. Lime-sulphur 1 in 40 plus lead arsenate 1 in 50 gave good control of scab when applied at periods from 30 to 70 hours

after inoculation, while the dusts and wettable sulphurs were only effective a few hours after infection began. Satisfactory control was given by lime-sulphur 1 in 40 at a temperature range of 42·8° to 78·8° F.

Root knots at the unions of piece-root grafted apple trees have been annually responsible for the destruction of many thousands of nursery trees [ibid., ix, p. 188]. In 42 trials conducted by A. J. Riker and his collaborators with about 40,000 one- and two-year-old trees in 1929, there was an average of 94 per cent. smooth unions in trees wrapped with nurseryman's tape, compared with only 75 per cent. in those wrapped with string or raffia. Wrapping with tape is a cheap and rapid procedure; expert workers can wrap 400 to 500 grafts per hour.

A. J. Riker and W. M. Banfield ascertained that crown gall of red raspberries (*Phytomonas* [*Bacterium*] *tumefaciens*) [ibid., ix, p. 395] occurs with about equal frequency during all the months of the growing season, involving all the underground parts, especially the roots in the upper three inches of the soil. Root-chewing insects were found to be largely responsible for the injuries through which crown gall infection takes place. In a greenhouse test none of the plants grown in infested soil, but protected against insect and planting injuries, contracted the disease, whereas 80 per cent. of the raspberries grown under similar conditions but not protected against insects became infected. At the close of the growing season in the field, 92 per cent. of the plants in the infested soil were diseased, with an average of 5·8 infections per plant.

Further experiments by J. G. Dickson and his collaborators in the development of wheat and barley varieties resistant to scab (*Gibberella saubinetii*) [ibid., ix, p. 369] showed that Michigan Amber and Fultz are the most resistant winter wheats and Progress the best of the spring varieties. Illinois No. 1 wheat, a mixture of types, proved fairly resistant in the field. None of the barley varieties tested showed any appreciable degree of resistance to *G. saubinetii*; among the most susceptible are Wisconsin Pedigree and 6 Oderbrucker.

Investigations have been conducted by J. C. Walker and H. L. Blood on bacterial canker of tomatoes (*Aplanobacter michiganense*) [ibid., x, p. 136], which was found on greenhouse plants in 1930 for the first time in Wisconsin. Under the conditions prevailing in the State, wounded roots appear to be the most important channels of infection. The minimum temperature for the development of the parasite was found to be 33·8° to 35·6° and the maximum 75·2° to 77·0°. The optimum soil moisture for the development of bacterial canker seems to be slightly below that for tomato growth.

A survey of tobacco plantations by J. Johnson in 1930 showed that mosaic is much more prevalent in Wisconsin than is usually believed, occurring in practically every field, sometimes on over 90 per cent. of the plants. The overwintering of the virus in the soil is not a serious factor except in heavily infested fields, and good control may generally be obtained by alternating tobacco with maize.

Research in botany.—*Fifty-second Ann. Rept. North Carolina Agric. Exper. Stat. for the fiscal year ended June 30, 1929*, pp. 78–91, 3 figs., 1930. [Abs. in *Exper. Stat. Record*, lxiii, 7, pp. 645–647, 1930.]

In the section of this report dealing with tobacco diseases Lehman states that evidence was obtained from field tests that the common tobacco mosaic virus overwinters in the soil and enters young plants through the roots. The practice of topping in the field greatly increased the percentage of mosaic plants unless care was taken to avoid contamination.

Favourable results were obtained from the seed treatment of cotton, especially early planted seed, with fungicidal dusts [against *Corticium solani*: cf. *R.A.M.*, ix, p. 290].

Of various fungicides used to control frog eye leaf spot of soy-beans [*Cercospora diazu*: ibid., ix, p. 289] none was effective, and soaking in water at 112° F. for 15, 20, and 25 minutes was also unsuccessful. *C. diazu* readily overwinters on diseased plant refuse and on the seeds. Autumn ploughing did not destroy the fungus, while Laredo soy-beans harvested in 1926 and planted in 1929 still carried the disease.

R. F. Poole states that black rot of sweet potatoes (*Ceratostomella fimbriata*) [ibid., ix, p. 290; x, p. 268] was the most important disease in storage, but that treatment of inoculated sweet potatoes before storing with Bordeaux mixture and certain dusts greatly reduced infection. Sweet potatoes inoculated with *Rhizopus nigricans* derived benefit from treatment with hydrated lime and Bordeaux mixture in dust and liquid form. Resistance to *Fusarium batatatis* [loc. cit.] was directly correlated with plant vigour, while resistance to *Monilochaetes infuscans* was associated with the arrangement of the root tubers on the plant, those varieties which form their tubers some distance out being the least affected. On sweet potato media *F. batatatis* has maintained its virulence since 1925. Nitrogenous manures by causing sweet potatoes to crack before harvest increased infection by *C. fimbriata*, while farm-yard and green manures increased *M. infuscans* by supplying a favourable growth medium for the organism. *F. batatatis, C. fimbriata*, and *M. infuscans*, all of which are 'seed'-borne and also live over in the soil, were checked by treating the sweet potato stems with Bordeaux mixture just before transplanting [ibid., x, p. 269]. *M. infuscans* was reduced by treatment with finely divided sulphur just before transplanting from 67·2 to 1·7 per cent.

Anthracnose [*Plectodiscella veneta*: loc. cit.] of dewberries [*Rubus* spp.] was reduced by cutting out old canes, but no control resulted from heavy applications of Bordeaux mixture after the canes were tied up in March, and again 30 days before harvest. Root rot (*Collybia dryophila*) [ibid., vii, p. 384] was not controlled on these hosts by any of the chemicals tested, and even the weakest solutions injured the plants. Cane blight (*Leptosphaeria coniothyrium*) was found to gain entrance to dewberries through pruning wounds when the old canes were removed; cutting below the soil surface prevented infection.

Colley (Mary W.). **Culture experiments with Pseudomonas tumefaciens.**—*Amer. Journ. of Botany*, xviii, 3, pp. 211–214, 4 graphs, 1931.

Details are given of the author's experiments to ascertain the optimum conditions for the growth of *Pseudomonas* [*Bacterium*] *tumefaciens* in a standard liquid synthetic medium consisting of 0·5 gm. monobasic potassium phosphate, 0·2 gm. magnesium sulphate, 1 gm. dextrose, 1 gm. asparagine, and water to make 1,000 c.c., and in slight variations of this medium. Growth was measured with a Kober nephelometer (*Amer. Journ. of Botany*, xviii, 3, p. 205, 1931) and by check plate counts. In general, the experiments showed that, with an initial hydrogen ion concentration between P_H 6 and 8, growth increased as the temperature rose to 28° C. in the presence of abundant oxygen and when the quantity of dextrose was increased. After ten days the hydrogen ion concentration became more or less uniform (about P_H 7·6); when the amount of dextrose was increased to 1 per cent. the P_H averaged 6·6. The optimum temperature for the development of the organism was found to be nearer 28° than 22° [*R.A.M.*, v, p. 348]. The nephelometer revealed a growth increase for 28° as compared with 22° of 98 per cent. for five days, 92 per cent. for seven, and 81 per cent. for ten. Both the 22° and 28° cultures contained many viable organisms at the end of ten days.

Cell division of the organism was found to proceed far more rapidly where an abundance of oxygen is available; this results, however, in exhaustion of the medium and probably in the development of by-products toxic to the organism itself.

Tube cultures originally containing 0·1 per cent. dextrose were shown by the Fehling test to contain some sugar after ten days' incubation at 22°, and sometimes after the same period at 28°. By averaging the results of many series it was found that a tube culture with 0·1 per cent. dextrose, having after inoculation about 17,500,000 organisms per c.c., incubated at 28°, contained 360,000,000 per c.c. after two days, 685,000,000 after five, 885,000,000 after seven, and 1,075,000,000 after ten.

[Ferraris (T.).] **Notizie fitopatologiche.** [Phytopathological notes.]—*Rivista Agricola*, xxvii, 604, p. 41, 1931.

In confirmation of Montemartini's recent statement [*R.A.M.*, x, p. 294] that in the climatic conditions prevailing in Italy *Erysiphe graminis* can produce conidia in winter, and his suggestion that it may overwinter solely in the *Oidium* stage, the author states that during winter he has frequently observed the *Oidium* stage (*O. monilioides*) with the conidia in active development on the leaves of wild barley (*Hordeum murinum*) and other wild grasses growing in the vicinity of Rome.

McDonald (J.). **Investigations on stem rust of Wheat in Kenya Colony.**—*Kenya Dept. of Agric. Bull.* 1 of 1931, 7 pp., 1 pl., 1931.

This bulletin contains, in addition to information already noticed from other sources, the following items of interest. Both the K1 and K2 forms of stem rust of wheat (*Puccinia graminis*) have

been obtained from almost the entire range of altitudes at which the crop is grown in Kenya [*R.A.M.*, x, p. 296]. Form K1, however, has been found nearly three times as often in the lower half of the range as in the upper, while K2 shows a preference for the higher altitudes. In three rust collections made at different times, both forms were found to have been present simultaneously.

The spores of K1 have been found to be significantly longer than those of K2. The results of inoculation tests on twelve American wheat varieties used as differential hosts indicate that K1 corresponds to the physiologic form of *P. graminis* known in the United States as 21 [ibid., ix, p. 233], while K2 is identical with 17 [ibid., x, p. 169]. A comparison of the spore dimensions confirmed these results in respect of K2 and form 17; material of form 21 was not available for investigation. It is highly probable, therefore, that any wheat varieties known to be resistant to the American form 17 may be imported into Kenya without fear of infection by K2, and there is little doubt that a similar relationship exists as regards forms 21 and K1.

It is stated in a supplementary note that strong evidence of the existence in Kenya of a third physiologic form of *P. graminis* was obtained after sending this bulletin to press.

EDGECOMBE (A. E.). **Immunological relationships of Wheats resistant and susceptible to Puccinia rubigo-vera triticina.** —*Bot. Gaz.*, xci, 1, pp. 1–21, 1931.

The investigations reported in some detail in this paper were made with a view to determining the serological relationships between species, varieties, and hybrids of wheat, selected on the basis of their resistance to red rust (*Puccinia rubigo-vera triticina*) [*P. triticina*]. Of the nine forms of wheat tested, one, highly resistant to the rust, belonged to the einkorn group (with 7 chromosomes); three, all rust-resistant, belonged to the emmer group (with 14 chromosomes); and five, varying from highly resistant to very susceptible, belonged to the *vulgare* group (with 21 chromosomes). Globulins, obtained pure by electrodialysis from each of the wheats tested, were injected into rabbits in duplicate six times at intervals of four days between each injection; nine days after the last injection the rabbits were bled, and three days later received a seventh injection of the globulins; eleven days after the eighth and final injection, the rabbits were again bled, and the antisera thus obtained were used in precipitin tests, in which each of the nine globulin extracts served as antigen against the antiserum prepared by its own injection (homologous), and against each of the antisera prepared by injection of the other eight globulins (heterologous).

In these tests the antiserum (in dilutions ranging from 1 in 10 to 1 in 2,560) was pipetted into a precipitin test tube, and an equal volume of antigen (at a concentration of 0·0005 gm. per c.c.) was carefully layered over it. The best precipitin rings were formed within the first hour of incubation at room temperature, and when the test antigen was adjusted to P_H 7 or to a slightly alkaline reaction. In each instance the homologous antigen and antiserum gave the highest titre in the ring precipitin formation, titre being

used in the sense of the highest dilution in which ring formation could be observed. Precipitin reactions, however, were also obtained for every antigen with every antiserum tested, indicating a considerable degree of relationship between the globulins of the wheat forms tested, or that all the forms have some globulins in common. The serological relationship appeared to be correlated with the chromosome number in the members of the 14 chromosome group studied; the correlation did not seem to be quite as definite for the forms of the 21 chromosome group, since some of them appeared to stand closer to forms of the 14 chromosome group than to others in their own group. The serological relationship of the various wheats tested also appeared to be closely paralleled by their relationship as measured by their relative resistance or susceptibility to *P. triticina*. In general, the indications are that relationships determined by the serological method are more in harmony with those determined by breeding and inoculation with *P. triticina*, than with relationships determined cytologically, using chromosome number as the criterion.

MARCHIONATTO (J. B.). **La presencia de la roya 'amarilla'.** [The presence of the 'yellow' rust.]—*ex* Dos informes sobre la roya 'amarilla' del Trigo. [*ex* Notes on the yellow rust of Wheat.]—*Min. Agric. Nac. (Buenos Aires) Secc. Prop. e Inform. Circ.* 836, pp. 3–5, 1931.

A brief, popular account is given of the symptoms and life-history of yellow rust of wheat (*Puccinia glumarum*) in connexion with its recent detection in 1929 in the Argentine [*R.A.M.*, x, p. 302]. The most susceptible varieties appear to be Record, San Martin, and the common wheats, such as Barleta, while the late sown 38 M.A. and Ardito are more resistant. This paper is followed (pp. 6–20) by a report from the Ministry of Agriculture on the distribution in October and November 1930 (also shown by means of a map and a detailed table of localities and varieties affected), ravages, and control of the disease. The area affected covered approximately 6,000,000 hect. and the losses caused were estimated at some 2,000,000 tons.

ADAM (D. B.) & PESCOTT (R. T. M.). **The control of loose smut in Wheat.**—*Journ. Dept. Agric. Victoria,* xxix, 3, pp. 141–145, 1 fig., 1931.

Experiments from 1927 to 1929 at the State Research Station, Werribee, Victoria, showed that loose smut of wheat (*Ustilago tritici*) was effectively controlled in the crop raised from seed-grain infected with the smut that had been treated for 1 hour and 40 minutes in hot water at 120° F. in the single-bath apparatus devised by Tapke [*R.A.M.*, v, p. 480]. The treatment had a depressing effect on the germination of the wheat, and as the process is complicated its use by farmers is not recommended, though it can be advantageously employed on seed stations to ensure the supply of clean seed-grain. In spite of the reduction in germination, the total yield of the crop from the treated seed was not apparently affected, although this may have been due to the fairly heavy rate of sowing used.

PASINETTI (L.). **Contributo allo studio delle sostanze anticrittogamiche (Esperienze col fideol). Nota II.** [A contribution to the study of fungicidal substances. (Experiments with fideol). Note II.]—*Riv. Pat. Veg.*, xxi, 1–2, pp. 1–10, 1931.

In field tests in which seed-grain of Villa Glori and Vittorio Veneto wheat was soaked for 7 to 15 minutes in 1 and 2 per cent. aqueous solutions of fideol [*R.A.M.*, ix, p. 328] the early growth of the plants was markedly stimulated; this effect, however, was only transitory, and the treatment led to no increase in yield. When the grain was artificially infected with *Tilletia levis* [*T. foetens*] before being soaked the results obtained showed that 7 or 15 minutes' immersion of the Villa Glori variety in a 1 per cent. solution resulted in 2 to 3 per cent. infection, while immersion in a 2 per cent. solution for the same period gave almost complete control, as compared with 8 to 10 per cent. infection in the untreated controls. With the much more susceptible Vittorio Veneto variety, while the untreated controls showed 40 to 50 per cent. infection, infection in the treated plants ranged from 7 to 8 per cent. (7 minutes' immersion in 1 per cent. fideol) to 2 or 3 per cent. in the wheat immersed for 7 minutes in a 2 per cent. solution and mere traces only in that immersed for 15 minutes in a 2 per cent. solution.

The fungicidal action of fideol against *T. foetens* is regarded as having been equally effective on both varieties and intensely strong.

LINDFORS (T.). **Försök med utsädesbetning utförda 1924–30.** [Experiments in seed-grain disinfection carried out from 1924 to 1930.]—*Centralanst. för försöksväsendet på jordbruksområdet Medd.* 390, 49 pp., 1931. [German summary.]

A comprehensive account, accompanied by 34 tables, is given of the laboratory and field experiments in the disinfection of cereal seed-grain against fungous diseases carried out in Sweden during the period from 1924 to 1930 [see next abstracts]. As a result of the trials the following treatments are recommended. *Fusarium* disease of rye [*Calonectria graminicola*] may be controlled by 15 minutes' immersion in 0·1 per cent. mercuric chloride, 30 minutes in 0·25 per cent. germisan or uspulun, uspulun dust (U.T. 687), and tutan, each at the rate of 2 gm. per kg., and possibly also by sprinkling with 2 l. per doppelzentner of a 2 per cent. solution of germisan.

The disinfection of wheat seed-grain (chiefly against bunt [*Tilletia caries* and *T. foetens*]) may be secured by 30 minutes' immersion in 0·25 per cent. uspulun or germisan, sprinkling with 0·46 per cent. weizenfusariol at the rate of 15 l. per 100 kg. (where the wheat is free from smut balls), and dusting with U.T. 687 or tutan at the rate of 200 gm. per doppelzentner.

Stripe disease of barley [*Helminthosporium gramineum*] and *Fusarium* disease of the same host are amenable to control by 30 minutes' immersion in 0·25 per cent. germisan or uspulun, as well as by dusting with U.T. 687 or abavit B at the rate of 3 and 4 gm. per kg., respectively. Tutan is efficacious against stripe

disease but cannot be recommended on account of its harmful effects on the plants.

For the combined control of loose smut of oats [*Ustilago avenae*] and *Fusarium* the best treatments are 20 minutes' immersion in 0·1 per cent. mercuric chloride with 0·1 per cent. formaldehyde (sublimoform), sprinkling with the same preparation at the rate of 15 l. per doppelzentner, and dusting with hafertillantin (3 gm. per kg.). Where only *Fusarium* is present 0·25 per cent. germisan, U.T. 687, and tutan may be recommended. Abavit B is liable to impair the germination of oats.

LINDFORS (T.). **Korta anvisningar rörande utsädesbetning.** [Brief instructions on seed-grain disinfection.]—*Centralanst. för jordbruksförsök Flygblad* 153, 6 pp., 4 figs., 1931.

Directions are given in popular terms for the disinfection of cereal seed-grain against some prevalent fungous diseases in Sweden [see preceding and next abstracts].

LINDFORS (T.). **Lönar det sig att beta vårsäden?** [Does it pay to steep spring seed-grain?]—*Tidskr. för Landtmän*, xiv, 11, pp. 200–201, 1931.

During the present period of financial depression, many Swedish farmers are inclined to economize in seed-grain disinfection, but the writer gives experimental data showing that the increased yields resulting from treatment are more than sufficient to counterbalance the expense. Thus, in 32 out of 36 tests in the disinfection of barley seed-grain with germisan (16), uspulun-universal (9), abavit B (7), and the new uspulun dust U.T. 687 (4), the average increase of yield was 315 kg. per hect., representing a net gain of about Kr. 30 per hect. The average increase of yield derived from the disinfection of oat seed-grain against loose smut [*Ustilago avenae*] with sublimatformalin (27 tests), hafertillantin (8), abavit B (12), tutan (13), and U.T. 687 (4) was 137 kg. per hect. In two of the tests there was some reduction of yield (in one case from germisan and in the other from abavit B). Considering only the two preparations guaranteed to give complete control of loose smut, viz., sublimatformalin (a mixture of mercuric chloride and formalin) and hafertillantin [*R.A.M.*, x, p. 237], an increased yield averaging 139 kg. per hect. was obtained in 30 out of 35 trials.

WINKELMANN (A.). **Zur Beizung des Saatgutes für die Frühjahrsbestellung.** [On the disinfection of seed-grain for spring sowing.]—*Deutsche Landw. Presse*, lviii, 11, p. 147, 1931.

Some figures are given of the cost of seed-grain disinfection against barley stripe [*Helminthosporium gramineum*], wheat bunt [*Tilletia caries* and *T. foetens*], snow fungus [*Calonectria graminicola*], and loose smut of oats [*Ustilago avenae*], for the current spring sowing in Germany [cf. preceding abstracts]. The immersion prices are based on an initial solution of 100 l. for wheat, 120 l. for barley, and 200 l. for oats per doppelzentner, the amounts required for replenishing the solution being 18, 24, and 40 l., respectively, at twice the original strength except in the case

of formaldehyde, which must be replenished only at the original strength [*R.A.M.*, iv, p. 492]. On this basis the immersion of 50 cwt. of wheat, barley, or oats in germisan costs M. 15·67, 20·67 and 67·58, respectively, the corresponding figures for uspulun-universal being M. 13·88, 22·90, and 37·63, and that of formaldehyde (for oats only) M. 6·38. Sprinkling with germisan (wheat only) costs M. 16·25 and with formaldehyde (oats only) M. 2·06 The cost of the germisan short disinfection process [ibid., ix, p. 101] is M. 19·50 for wheat and M. 24·38 for barley. Dusting with abavit B costs M. 22 for wheat and M. 55 for oats; ceresan M. 22, 33, and 55 for wheat, barley, and oats, respectively; hafertillantin M. 37·13 for oats only; and tillantin M. 22 and 44 for wheat and barley, respectively. In connexion with the use of hafertillantin it is pointed out that the oats must be left for at least one day after treatment, preferably in heaps covered with thick sacks.

FOËX (E.) & ROSELLA (E.). **Recherches sur le piétin.** [Researches on foot rot.]—*Ann. des Épiphyties*, xvi, 2, pp. 51–82, 10 pl., 8 figs., 1931.

This is a detailed and fully illustrated account of the results obtained by the authors in their two years' study of the symptomatology, morphology, and behaviour on various culture media of the fungi involved in the causation of foot rots of wheat in the region of Paris, a summarized report of which has already been noticed [*R.A.M.*, ix, p. 640]. In addition to the information previously recorded, it is stated that the undetermined eye spot fungus has not yet been found fructifying either in nature or in pure culture, for which reason it could not be identified and is provisionally designated by the letter 'x'. *Cercosporella herpotrichoides* was frequently seen associated with the mycelial wefts of the 'x' fungus, and in hanging drop culture the conidia of the former on germinating produce conidial or mycelial plaques very reminiscent of those in the 'x' fungus. Although *C. herpotrichoides* occasionally developed on wheat plants in pots infected with pure culture of the 'x' fungus, it never appeared in pure cultures of the latter, for which reason it cannot be affirmed to be the conidial stage of this fungus.

In conclusion it is stated that only the 'x' fungus and *Ophiobolus graminis* were definitely shown to be pathogenic to wheat both in nature and under experimental conditions, and the great majority of the cases of wheat foot rot in the vicinity of Paris is ascribed to their activity.

MORITZ (O.). **Zum Problem der Fusskrankheit des Weizens.** [Contribution to the problem of foot rot of Wheat.]—*Angew. Bot.*, xiii, 2, pp. 151–161, 1931.

The author's investigations [a brief preliminary account of which is given in general terms] on the occurrence of foot rot (blackleg) of wheat (*Ophiobolus graminis*) in Slesvig-Holstein were directed towards the establishment of a working hypothesis of the etiology of the disease in agreement with the observed facts.

The hydrogen ion concentration of the soil of most of the fields

in which the disease occurred was about P_H 6·0, but heavy damage was observed over a range of P_H 4·9 to 7·3 [*R.A.M.*, ix, pp. 586, 668]. No consistent effect of manuring on the incidence of infection could be detected, but the well-known fact that wheat following barley is liable to specially severe injury was again confirmed.

O. graminis was obtained in the perithecial stage in at least 40 per cent. of all the cases of typical foot rot examined in the summer of 1929, and in 75 per cent. of those of 1930. The fungus, however, may be found in a sporadic form on individual plants in fields free from noticeable injury, e.g., in the Slesvig-Holstein marshes. It was possible to induce infection in plants grown under these conditions but only where inoculation was performed with relatively large amounts of inoculum in a fresh condition and placed in close contact with the seed-grain. The typical symptoms of foot rot failed to develop in the absence of *O. graminis*, although the phenomenon of 'deaf ears' and brittleness of the haulm bases resulted from the exclusive use of nitrogenous manures. It is apparent, therefore, that the fungus plays an important part in the etiology of foot rot, but it does not appear to be the sole agent in the causation of the disease.

None of the species and varieties of wheat hitherto tested appears to be immune from foot rot in the field, or under laboratory conditions (experiments on seedlings in sand cultures in Neubauer dishes). The only known form of resistance is that conditioned by the environment, involving further study of the influence of the soil structure on the physiological and parasitological reaction capacity of the plants. The lines on which this problem should be approached are briefly discussed.

TAYLOR (H. J.) & MAHER (C.). **Root rot, foot rot and head blight of Wheat in Kenya.**—*Kenya Dept. of Agric. Bull.* 4 of 1931, 15 pp., 1931.

A wheat disease new to Kenya, appearing in the form of root rot, foot rot, seedling blight, and head blight, is reported to have been observed in Kenya during 1929 and 1930. At first *Gibberella saubinetii* and *Fusarium culmorum* were suspected of causing the disease [the symptoms of which are described in popular terms], but an examination at the Imperial Mycological Institute of infected material from Njoro showed the presence of *Cephalosporium acremonium* and four different species of *Fusarium*, of which two appear to be akin to *F. herbarum* and *F. avenaceum* [*R.A.M.*, ix, p. 667]. Probably the two other undetermined species are of lesser importance in the etiology of the disease, but it is not yet certain which of the organisms is chiefly responsible for the damage. Affected plants were liable to secondary infection of the ears by *Septoria nodorum* [ibid., ix, p. 173 *et passim*].

The root rot and head blight disease occurred at altitudes of 6,100 to 7,600 ft. In some cases the injury was so severe that the crop could not be reaped. Infection was most virulent on wheat growing in small depressions likely to collect water after heavy rains, and probably much of the damage in 1930 was due to the exceptionally heavy rainfall. Encouraging results were given by

experiments, on a small scale, in the control of the disease by the application to the soil of calcium cyanamide at the rate of 200 lb. per acre, combined with seed-grain disinfection with tillantin R dust. The varieties so far found to be affected by the root rot and head blight are Kenya Governor, Kenya Standard, B.F_2.36.C.1 (L), and Equator.

ITO (S.) & KURIBAYASHI (K.). **The ascigerous forms of some graminicolous species of Helminthosporium in Japan.**—*Journ. Fac. Agric., Hokkaido Imper. Univ.*, Sapporo, Japan, xxix, 3, pp. 85–125, 3 pl., 1931.

This is an expanded account of the ascigerous forms of the species of *Helminthosporium* parasitic on cereals in Japan, a preliminary note on which by the first-named author has already been published [*R.A.M.*, x, p. 232]. It is stated that *Pyrenophora trichostoma*, which is often considered to be the ascigerous stage of *H. gramineum*, differs from the latter (*P. graminea*) by its smaller ascospores (44 to 50 by 17 to 20, as compared with 45 to 75 by 20 to 32·5 μ). The authors also agree with Drechsler [ibid., iii, p. 66] that the perithecial fungus regarded by Noack and others as the perfect stage of *H. gramineum* really belonged to *H. teres* and was identical with Diedicke's *Pleospora teres* (*Pyrenophora teres* (Sacc.) Drechsler).

RICHTER (H.). **Das Dumpfigwerden und Verschimmeln des Getreides.** [The 'mustiness' and 'mouldiness' of grain.]—*Mitt. Gesellsch. für Vorratsschutz*, vii, 1, pp. 2–5; 2, pp. 22–23, 7 figs., 1931.

Popular notes are given on the occurrence and prevention of 'mustiness' and 'mouldiness' in stored cereal seed-grain in Germany. This phenomenon is most liable to occur where the moisture content of the grain exceeds 15 per cent., the principal fungi concerned being *Penicillium*, *Citromyces*, and *Aspergillus* spp., followed by *Mucor* spp., *Rhizopus nigricans*, *Fusarium culmorum*, *F. herbarum*, *Alternaria tenuis*, *Dematium pullulans*, *Trichothecium roseum*, and actinomycetes. Incipient mustiness may be checked by an admixture of charcoal or washing with 3 per cent. hydrogen peroxide. In more advanced cases the grain should be treated with 2 per cent. sulphuric acid (4 to 5 hours for rye and wheat, 7 to 8 for barley and oats) followed by thorough washing, and used only for fodder. On no account should musty grain be used for seed, since the resulting plants make poor growth and give an inadequate yield.

SCHROETER (G.) & STRASSBERGER (L.). **Cholin als Schadstoff in kranker Gerste.** [Cholin as toxin in diseased Barley.]—*Biochem. Zeitschr.*, ccxxxii, 4–6, pp. 452–458, 1931.

The writers' researches [full technical details of which are given] at the Chemical Institute of the Berlin Veterinary College on the nature of the toxic principle in the American barley samples infected by *Gibberella saubinetii* [*R.A.M.*, ix, p. 643] indicated that the symptoms of poisoning in animals are induced by cholin or readily hydrolysable fatty acid esters of cholin, which are present in the affected grain in abnormally large amounts.

REED (G. M.). **Reports on research for 1930. Plant pathology.**—*Twentieth Ann. Rept. Brooklyn Bot. Gard., 1930 (Brooklyn Bot. Gard. Record,* xx, 2), pp. 78–83, 1931.

During 1930 the author continued his investigations into the inheritance in oat hybrids of resistance to loose and covered smuts [*Ustilago avenae* and *U. kolleri*]. Several F_3 progenies of the cross between Early Gothland (very susceptible to *U. avenae*, but resistant to *U. kolleri*) and Monarch (reverse reaction) [*R.A.M.*, ix, p. 519] were completely resistant to both smuts, while others were susceptible to one and resistant to the other. The results obtained indicate that the factors determining resistance to the two smuts in these hybrids are independent of each other. Significance is attached to these facts in relation to the data obtained with such crosses as Hull-less × Black Mesdag, in which resistance to the two smuts appears to run entirely parallel.

Experiments conducted to determine whether the growth of the oat plant influenced the subsequent development of the smut organism indicated that the factors that are most effective in influencing the appearance of smut are those acting during the very early seedling stages when infection takes place. After the fungus has entered the plant, the subsequent rate and amount of growth of the latter do not, apparently, prevent the final development of the parasite in the flowers.

TURNER (DOROTHY M.). **Leaf spot of Oats.**—*Agric. Prog.*, viii, pp. 131–132, 1931.

A leaf spot of oats, common in the cooler, moist districts of the north of England and south-west of Scotland, is attributed to *Helminthosporium avenae* [*R.A.M.*, ix, p. 771; x, p. 232]. The primary stage of infection originates with the penetration of the mycelium, resting within the pericarp cells, into the developing embryo. Entry occurs chiefly at the junctions of the scutellum and epiblast, the fungus passing into the coleoptile cells whence it reaches the first, second, and third leaves. In cases of heavy infection the growing point is killed, but where the rate of growth exceeds that of fungous invasion the fourth leaf escapes and normal development proceeds. The secondary stage is not usually sufficient to cause serious loss, but the spores developed in the reddish-brown, confluent, striate lesions on the dead seedlings infect the ripening grain and spread the disease to the succeeding crop.

H. avenae is stated to grow well on most media, but it could not be induced to sporulate in culture. Spores are best obtained by growing seedlings aseptically and inoculating them; after incubation the lesions produce conidia in abundance. Considerable variations were observed in spore shape, including a frequent tri-pointed form; the usual dimensions are 15 to 55 by 13 to 18 μ.

Inoculation experiments both with mycelium and conidia gave positive results, followed by reisolation of the fungus in pure culture. The most important source of infection is the mycelium within the pericarp cells. Some degree of control was secured by two to three hours' immersion of the seed-grain in 0·16, 0·25, or 0·125 per cent. formalin.

DOYER (L[UCIE] C.). **Over de beteekenis van ontsmetting voor Haver.** [On the importance of disinfection for Oats.]—Reprinted from *Landbouwkundige Tijdschr.*, xii, 510, 2 pp., 1930. [Received June, 1931.]

Good results in the control of leaf spot of oats (*Helminthosporium avenae*) [see preceding abstract] are stated to have been obtained at the Dutch Seed Testing Station by seed-grain disinfection with germisan or hafertillantin. In germination trials by Hiltner's brick dust method [*R.A.M.*, x, p. 327], nearly all the seedlings developing from the treated seed-grain were healthy. Leaf spot of oats, formerly considered of slight importance, has recently been responsible for heavy damage in Germany [ibid., x, p. 233], and is very prevalent among seed oats in Holland.

RAMAKRISHNAN (T. S.). **A leafspot disease of Andropogon sorghum caused by Cercospora sorghi E. & E.**—*Mem. Dept. Agric. India*, Bot. Ser., xviii, 9, pp. 259–277, 4 pl., 5 graphs, 1931.

A leaf spot disease of sorghum caused by *Cercospora sorghi* Ell. & Everh. has been prevalent in and near Coimbatore, Madras, for some years, affecting a number of varieties and selections. It usually appears about the time of flowering but occasionally on plants a month old, forming elongated spots 5 to 15 by 3 to 5 mm. in diameter on the lower leaves, extending later to the upper ones. The colour of the spots varies from dark purplish-red with a lighter red ring to yellowish or light brown with an orange or red margin. Similar but larger spots appear on the leaf sheaths and small red lesions are rarely found on the upper part of the stem.

The mycelium of *C. sorghi* is confined to the parenchyma and accumulates in stromatic masses below the stomata, through which the conidiophores emerge in clusters. The latter are simple or branched, septate, geniculate, and average about 71 by 4·6 μ. The geniculations mark the position of insertion of the conidia, the latter being hyaline, tapering, 30 to 132 by 3 to 8 μ (average 73·1 by 5·8 μ), with 1 to 12 (mostly about 6) septa. On germination they sometimes form small brown conidiophores directly, which bear normal conidia.

Inoculation experiments on maize (which is susceptible to the fungus in other countries) [*R.A.M.*, vii, p. 712; ix, p. 63], groundnut, eggplant, and tobacco gave negative results, but slight infection occurred on wounded sugar-cane leaves. The pathogenicity of *C. sorghi* would thus appear to be very limited.

Concentric zones are formed in cultures kept in the light during the daytime but not on those maintained in complete darkness, indicating that zonation is caused by the normal alternations of light and darkness [cf. ibid., iv, p. 628]. Growth in complete darkness does not affect the dimensions of the spores formed in cultures. The fungus induces an alkaline reaction in the medium on which it grows. Media of +20 Fuller's scale or P_H 4 to 6 are best adapted to its growth. On Richards's medium the development of the fungus was found to be much retarded if the concentration is increased above the normal, a similar but slighter effect being produced by dilution. Sugar and KNO_3 are essential

to the growth of *C. sorghi,* which was adversely affected by the withdrawal of either constituent (especially the former) from the medium. An excess of KNO_3 was also found to be detrimental to the fungus. No growth occurred at a temperature of 37° to 38° C.

UPPAL (B. N.) & DESAI (M. K.). **Physiologic specialization in Sclerospora graminicola.**—*Phytopath.*, xxi, 3, pp. 337–338, 1931.

Abundant infection was produced at Poona, India, on *Setaria italica, S. magna,* and *Euchlaena mexicana* by the oospores of *Sclerospora graminicola* collected from *S. viridis, S. magna,* and *S. italica* [*R.A.M.*, x, p. 450]. *Pennisetum typhoideum,* however, could only be infected by oospores taken from the same plant, and not by those collected from the above-mentioned species of *Setaria.* Likewise the oospores from *P. typhoideum* failed to infect *Setaria* spp. These data confirm the observation of Weston and Weber that the downy mildew on *S. magna* does not pass to *P. typhoideum* under field conditions in Florida [ibid., viii, p. 99]. Butler has also reported ('Fungi and disease in plants', 1918) that the fungus on *S. italica* did not pass to *P. typhoideum* near Pusa.

These observations and experimental data suggest the existence of at least two physiologic forms of *Sclerospora graminicola,* one attacking *P. typhoideum* only, while the other can infect the three above-mentioned species of *Setaria* and *E. mexicana.* None of the collections of oospores of either physiologic form produced infection on *Panicum miliaceum* or *S. glauca,* a result partially confirmed by the work of Melhus and his collaborators [ibid., vii, p. 712].

TINDALE (G. B.) & FISH (S.). **Blue and green moulds of Oranges.** —*Journ. Dept. Agric. Victoria,* xxix, 2, pp. 101–104, 2 graphs, 1931.

An examination of oranges in packing sheds in Victoria showed that the important sources of infection by blue and green moulds (*Penicillium italicum* and *P. digitatum*) [*R.A.M.*, ix, p. 647] are the spores in the air of the shed and in the dust on the grader. Both moulds were spread from diseased to sound fruit by contact. Temperature studies showed that when shallow inoculations were made the incubation period for *P. italicum* at 40° F. was 23 days, that for *P. digitatum* at the same temperature being at least 50 days; at 38° the corresponding periods were, respectively, 42 and 66 days; at 34° and 32° no symptoms developed even after 86 days. When the moulds appeared *P. digitatum* grew faster than *P. italicum* at 36° to 40°, but at 60° the difference between the rates of growth was much less marked. The optimum for both was between 70° and 78°, at which temperature the incubation period was only about 3 days [cf. ibid., vii, p. 238]. When deep inoculations were made, there were less differences between the incubation periods of the two fungi.

When shallow inoculations were made with both moulds and the oranges, after being kept for one day at 78°, were placed at 94° for 2 days, 80 per cent. of the inoculations failed to take, this figure rising to 100 per cent. after 5 days at the higher temperature. When deep inoculations were made 7 days' retention at 94° was

necessary to prevent infection; after 4 days at this temperature the fruit developed an unpleasant flavour.

It is suggested that infection by blue and green moulds may largely be prevented by keeping susceptible varieties of orange for 3 days at 94°.

SHEAR (W.). **Leaf disease of Palms in California.**—*Plant Disease Reporter*, xv, 2, pp. 17–18, 1931. [Mimeographed.]

A specimen of a leaf disease on the native palm *Neowashingtonia filamentosa*, sent by W. Shear from San Diego, California, was identified by C. L. Shear as due to *Phaeochora neowashingtoniae* (Shear) Theiss. and Syd. The fungus appears to have been first observed in southern California in 1907, and was described by Shear as *Sphaerodothis neowashingtoniae* (*Mycologia*, i, p. 161, 1909). In a note accompanying the specimen it is stated that the fungus was found infecting the leaves of *N. filamentosa* when planted by some of the oldest nurserymen of the locality on their arrival about forty years ago. Since then the palms have continued to grow without any apparent serious damage. During cold, damp weather many of the lower leaves turn yellow and die, but on the return of warmer conditions the palms generally recover, except in the case of younger plants in places where soil and climate are less favourable.

Het standpunt van de proefstations inzake de verspreiding van topsterfte door middel van plantmateriaal. [The standpoint of the experiment stations as regards the spread of top die-back by means of planting material.]—*De Bergcultures*, v, 10, pp. 253–254, 1931.

On 24th February, 1931, the Directors of the Malang, Besoeki, and General Agricultural Experiment Stations, the chief of the Institute for Plant Diseases at Buitenzorg, the botanical expert attached to the latter institution, and the Director of the Government Rubber Estate, met to consider their position in regard to the possible spread of top die-back of coffee [*R.A.M.*, x, p. 298] by means of planting material from two plantations (Soember Asin and Bangelan) in which the disease occurs.

The question at issue was whether the export of selected planting material from these plantations should be discontinued on account of the risk of disseminating the disease, a step held to be inadvisable since the bulk of the superior planting material required for the improvement of estates is supplied by Soember Asin and Bangelan. Ultimately it was decided that the export of rooted grafts and coffee seed from these plantations should proceed as usual under certain definite safeguards. The chances of the disease being spread by the agency of this material are regarded as extremely remote. Diseased trees are readily recognizable even when only one branch is infected, and there is no mycological or anatomical evidence for the transmission of top die-back through the seed, the progeny of seed from affected trees being apparently healthy. Seed from the two above-mentioned plantations destined for export to non-infected areas will be disinfected before dispatch. Pending the determination of the exact manner in which the

disease spreads from plant to plant, the grafts in the beds will be sprayed with a fungicide at frequent intervals. Since there is just a possibility that cuttings intended for use as scions from apparently healthy trees may actually be diseased, no graft cuttings will in future be sent from infected to non-infected areas.

BECKLEY (V. A.). **The 'yellowing of Coffee'.**—*Kenya Dept. of Agric. Bull.* 3 of 1931, 6 pp., 1 pl., 1931.

The chlorosis and die-back of coffee which became widespread in Kenya after the long rains of 1930 are attributed to nutritional disturbances which may be regulated by a suitable scheme of manuring. Chlorotic trees were heavily infected by *Hemileia vastatrix* [*R.A.M.*, x, p. 239].

MOORE (E[NID] S.). **Internal boll disease of Cotton in South Africa.**—[*ex* Report on Cotton insect and disease investigations Part I.]—*South Africa Dept. of Agric. Sci. Bull.* 94, pp. 11–18, 1930. [Received May, 1931.]

The internal boll disease of cotton associated with *Nematospora gossypii* and *N. coryli* [*R.A.M.*, x, pp. 102, 298] was first observed in South Africa during 1925–6. Subsequently it has been reported from several parts of the Union and also from Portuguese East Africa. Of the two fungi concerned (which were identified by S. F. Ashby), *N. gossypii* is by far the commoner, *N. coryli* having been found only in one field in the north Transvaal. Four of the ochre or yellowish-green bacterial strains frequently found in unopened decayed bolls, either as a sequel to *Nematospora* infection or independently, were shown by inoculation tests to be capable of attacking both cut and growing bolls and discolouring the lint.

Extensive field observations have conclusively established that internal boll disease arises as a result of infestation by the two cotton stainers, *Dysdercus fasciatus* and *D. nigrofasciatus*. The insects usually appear in March or April; bolls maturing before this time escape the *Nematospora* infection, which becomes increasingly severe on those developing in May and June. Confirmation of the connexion between the stainers and the fungus was obtained by experiments on caged plants, and further by the demonstration of *Nematospora* in a living condition within the mouth parts and digestive tract of stainers feeding on infected cotton plants.

Infection by both species of *Nematospora*, but chiefly *N. coryli*, has been found in the seeds of a number of bean varieties, including kidney and sugar beans [*Phaseolus vulgaris*], mung beans [*P. mungo*], and soy-beans [*Glycine soja*]. Other hosts of the fungi in South Africa are *Bauhinia galpini* (*N. coryli*) and *Sterculia platinifolia* (*N. gossypii*). The latter was found to be used as a breeding-ground by stainers, and when they left it in April for the adjacent cotton field, a corresponding development of lint staining by *N. gossypii* began to appear in the rows first invaded.

SHAW (F. W.). **A morphological study of the genus Monilia.**—*Zentralbl. für Bakt.*, Ab. I (Orig.), cxix, 7–8, pp. 460-464, 1 pl., 1931.

An expanded account is given of the writer's comparative morphological study of six species of *Monilia*, viz., *M.* [*Candida*] *albicans* Robin, *M.* [*C.*] *krusei*, *M. zeylanoides*, *M. richmondi*, *M.* [*C.*] *psilosis*, and *M. albicans* (?) Wallace & Tanner (*Amer. Rev. Tuberc.*, xv, p. 373, 1927) [*R.A.M.*, vii, p. 168; viii, p. 103; x, p. 312].

The organisms were found to differ in one or more of the following respects: (1) character of the growth on dextrose agar slants; (2) colony formation on dextrose agar plates; (3) microscopical appearance of stained slide preparations from dextrose agar slants; (4) macroscopic and microscopic differences on gelatine stabs (*a*) in the character of the growth from the line of stab, and (*b*) in the width of the mycelium, length of mycelial cells, morphology of the moniliform clusters, and the shape of the spores in these clusters.

Sections of gelatine stab cultures of *C. albicans* Robin show a segmented mycelium with clusters of round spores on small branches (?conidiophores) at regular intervals along the hypha. *C. psilosis* presents quite a different aspect from *C. albicans* in section, appearing as a network of fine mycelial hyphae with special branches breaking up into spores like oidia. The mycelium is approximately half the diameter of that of *C. albicans*. *C. psilosis* makes a large fuzzy growth from the stab. *C. krusei* was found to resemble *C. albicans* except for its elliptical spores. Gelatine stab cultures of *M. richmondi* showed outgrowths from the line of stab consisting of small bead-like bodies, somewhat resembling those formed by *C. albicans* and constituted by short conidiophores bearing oval conidia measuring 3 by 1 μ. *M. albicans* (?) Wallace & Tanner differed from *C. albicans* Robin in the presence of numerous outgrowths and in the oval instead of round spores.

BECK (M. DOROTHY), TRAUM (J.), & HARRINGTON (EILEEN S.). **Coccidioidal granuloma. Occurrence in animals—reference to skin tests.**—*Journ. Amer. Veter. Med. Assoc.*, N.S., xxxi, 4, pp. 490–499, 1 fig., 1 map, 1931.

Ten new cases of coccidioidal granuloma (*Coccidioides immitis*) [*R.A.M.*, x, p. 310] in cattle in California are reported, making 20 in all since 1892. The corresponding number of human cases during the same period is 246, of which 218 (88 per cent.) originated in California.

A characteristic feature of *C. immitis* is the different type of growth in artificial media, in which it develops as a mould, from that in the tissues, pus, and sputum, where it appears as spherical cells, 5 to 60 μ in diameter (average 30 μ) with a highly refractile, double-contoured capsule.

In animals the lesions are confined to the bronchial and mediastinal lymph nodes. No evidence has been obtained of animal to man transmission or vice versa. A specific allergic skin reaction

has been secured with coccidioidin in infected animals, and a similar reaction was also observed in man.

MÜNSTERER (H. O.). **Beitrag zur Kenntnis der Dermatomykosen Südbayerns und zur Kasuistik der Sporotrichose.** [Contribution to the knowledge of the dermatomycoses of South Bavaria and to the etiology of sporotrichosis.]—*Arch. für Dermatol.*, clxiii, 1, pp. 97–113, 2 figs., 2 graphs, 1931.

Microsporon audouini and *Trichophyton gypseum* were found to be the most prevalent causes of dermatomycosis in the Munich district, occurring in 38 and 19 cases, respectively, of the 117 examined in the course of a year. *Achorion schoenleini* was responsible for four cases of favus, and an organism allied to *Mastigocladium* caused the death of a 45-year-old woman who had been suffering for nine years from a disorder diagnosed as sporotrichosis.

Fungous diseases are stated to constitute 3 to 4 per cent. of the total number of dermatoses in South Bavaria, the pre- and post-war figures being similar except for the period from 1918 to 1921, when the incidence of mycoses rose to nearly 22 per cent.

CATANEI (A.). **Recherches sur les teignes dans la région d'Oran (Algérie). Deuxième observation algérienne de microsporie due à M. audouini.** [Studies on ringworms in the Oran district (Algeria). Second Algerian observation of microsporosis due to *M. audouini.*]—*Bull. Soc. Path. Exot.*, xxiv, 3, pp. 177–181, 1931.

Continuing his studies on the incidence of ringworm in Algeria [*R.A.M.*, x, p. 105], the author examined 1,504 children in the Oran district—1,136 of European (Spanish and Italian) origin and 368 natives. There were 28 cases of trichophytosis associated with *T. violaceum* (10 European and 2 native), *T. glabrum* (12 native), *T. acuminatum* (3 European), and *T. crateriforme* (1 European); 17 of favus caused by *Achorion schoenleini*; and 1 of microsporosis due to *Microsporon audouini.* This is stated to be only the second record in Algeria of *M. audouini*, which appears to be rare in Mediterranean countries.

GOLDSMITH (W. N.). **A case of erythema multiforme apparently of trichophytic origin.**—*Brit. Journ. of Dermatology*, xliii, 3, pp. 121–125, 1 pl., 1931.

Particulars are given of a case of typical erythema multiforme of the hands, elbows, and feet of a young woman engaged in laboratory work with mice. The condition started with acute inflammation of the right fourth finger, whence it spread in 10 to 12 days to the other sites. The fungus cultured from the lesions on the hands (but not found in those of the feet) was characterized on Sabouraud's medium by concentric growth, the innermost zone being slightly raised, white and velvety, the intermediate smooth and ochre-coloured, and the outermost white and plaster-like. The organism was identified as *Trichophyton* (*Epidermophyton*)

interdigitale or Kaufmann-Wolf's fungus [*E. inguinale* or *E. floccosum*: *R.A.M.*, x, p. 313]. An intradermal injection with 0·1 c.c. of powdered trichophytin produced an immediate and intense reaction, following which the symptoms quickly abated. The facts of this case are considered to be compatible either with the view that trichophytids are caused by an endotoxin, or else that fragments of the organism itself are responsible.

TALICE (R. V.). **Sur une souche de Trichophyton ferrugineum (Ota, 1921) (Microsporum ferrugineum Ota, 1921) isolée à Montevideo.** [Note on a strain of *Trichophyton ferrugineum* (Ota, 1921) (*Microsporum ferrugineum* Ota, 1921) isolated in Montevideo.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 1, pp. 77–86, 3 figs., 1931.

A brief account is given of a fungus isolated from a kerion on a native child in Montevideo, Uruguay, which in the original cultures on Sabouraud's medium produced a typically glabrous, faviform growth of a dark reddish-yellow (rust) colour, and which was identified as the organism described by Ota in 1921 as *Microsporon ferrugineum* [*R.A.M.*, viii, p. 173], an organism which hitherto had only been recorded from the Asiatic Far East, and had not previously been isolated from a kerion. When, however, the fungus was grown on natural substrata [ibid., ix, p. 781], especially horse dung, it produced sporiferous hyphae and aleuria characteristic of the genus *Trichophyton*, and subsequent cultures on solid media assumed an increasingly downy character. For this reason, as well as because *M. ferrugineum* had been referred by Ota and Langeron to the genus *Grubyella*, which has since been dropped [ibid., x, p. 243], the author establishes for it the new combination *Trichophyton ferrugineum* (Ota, 1921), the strain studied by him being regarded as a distinct variety, var. *uruguayensis*.

AGOSTINI (ANGELA). **Una nuova specie di 'Bodinia' causa di tigna umana nell' Eritrea.** [A new species of '*Bodinia*' causing human ringworm in Eritrea.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, ii, pp. 117–125, 5 figs., 1930. [Latin summary.]

This is a brief morphological and cultural account of a fungus isolated from a human ringworm (not involving the skin of the scalp) in Eritrea. On the usual culture media the organism forms first white and floccose, later pulverulent-arachnoid colonies adhering to the substratum; the mycelium is abundantly branched and bears intercalary or acrogenous, rounded, oblong or irregularly shaped arthrospores, 4 to 9 μ in diameter, and also intercalary, irregular chlamydospores measuring 40 by 14 to 20 μ. The fungus is identified as a hitherto undescribed species of the genus *Bodinia* which was established in 1923 by Ota and Langeron [but not maintained by Langeron and Milochevitch: *R.A.M.*, x, p. 243], and is named *B. abissinica*, a Latin diagnosis of which is given. Its main morphological and cultural characters are compared in a table with those of the five hitherto known species of this genus.

Da Fonseca (O.) & Da Rosa (A. F.). **Sobre a 'keratomycosis nigricans palmaris'.** [On 'keratomycosis nigricans palmaris'.] —*Rev. Med.-Cir. Brasil*, xxxviii, 9, pp. 337–344, 1 pl., 1930. [English translation.]

Full clinical details are given of the condition known as 'keratomycosis nigricans palmaris' or 'tinea nigra palmaris', first reported from Brazil, where it is attributed, as a result of Horta's investigations in 1921, to a species of *Cladosporium* distinct from *C. mansoni* [*R.A.M.*, x, p. 105], viz., *C. wernecki*. Brief notes are given on the occurrence of this condition in a white Brazilian girl.

Fraga (A.). **Sobre um caso de dermatite ulcero-nodular causada pelo Hormodendrum langeroni.** [On a case of ulcero-nodular dermatosis produced by *Hormodendrum langeroni*.]—*Rev. Med.-Cir. Brasil*, xxxviii, 9, pp. 321–336, 1 pl., 1 fig., 1930. [English translation.]

Details are given of the cultural and morphological characters of *Hormodendrum langeroni* [*R.A.M.*, vii, p. 240], which was isolated from an ulcero-nodular lesion on the inner side of the right leg of a Brazilian negress.

On most of the standard media used the colonies were dark green to greyish, irregular, cerebriform, or rugose. The mycelium is composed of cylindrical, septate, undulating, branched hyphae, 2 to 4 μ in transverse diameter and sometimes anastomosing. The conidiophores arise perpendicularly from the fertile hyphae and are often branched, the branches consisting of a single or more frequently several articulated and easily dissociated cells. A number of small excrescences or tubercles ('disjunctors') about 1 μ in height are formed at the tip of the apical cell of the unbranched part of each conidiophore by a localized thickening of the cell wall, and each carries a branch cell or a chain of conidia. Similar structures occur singly at the base of each cell of each branch of the conidiophore or of each conidium. The branches arising from the disjunctors are claviform or subcylindrical and arranged in fascicles or verticils. These so-called 'intermediate cells' measure 7 to 12 by 3 to 4 μ and bear one or more acropetally formed chains of cells becoming ovoid or fusiform. The dissociated units of the chain, which is readily disintegrated, are termed blastospores by the author and serve exactly the same purpose as conidia; they measure on an average 7 to 8 by 4 to 5 μ (sometimes 2·5 to 14 by 2·5 to 6 μ) and are navicular or ovoid, rarely uniseptate.

Grieve (B. J.). **Rose diseases and their control.**—*Journ. Dept. Agric. Victoria*, xxviii, 7, pp. 385–396; 8, pp. 490–496, 1930; xxix, 3, pp. 146–149, 9 figs., 1931.

In this paper a separate brief account [compiled from the researches of other workers] is given of the symptoms, morphology, biology, taxonomy, and control of each of the five more important diseases of roses which have been recorded from Australia, namely, mildew (*Sphaerotheca pannosa*) [*R.A.M.*, ix, p. 473]; black spot (*Diplocarpon rosae*) [ibid., x, 385]; crown gall (*Bacterium tumefaciens*); common or stem canker (*Leptosphaeria coniothyrium*)

[ibid., viii, p. 648; ix, p. 722]; and rust (*Phragmidium mucronatum* (Pers.) Schlecht., also known as *P. subcorticium* or *P. disciflorum*) [ibid., viii, pp. 39, 291]. A list is appended of other species of *Phragmidium* known to attack roses outside Australia.

LUDWIGS [K.]. **Schädigungen an Blumenzwiebeln, besonders an Hyazinthen und Tulpen.** [Injuries to flower bulbs, especially Hyacinths and Tulips.]—*Blumen- und Pflanzenbau*, xlvi, 3, pp. 39–40, 3 figs., 1931.

Attention is called to the recurrence in Germany, among hyacinth bulbs imported from Holland, of the yellow rot disease (*Pseudomonas hyacinthi*) which caused such heavy and extensive damage during 1925–6 [*R.A.M.*, v, p. 669; x, p. 386]. The incidence of this disease had considerably declined in the intervening period, presumably as a result of more rigorous inspection of the fields [ibid., v, p. 612 and below, p. 560]. The occurrence of the tulip diseases caused by *Botrytis tulipae* and *Sclerotium tuliparum* [ibid., x, p. 32] appears to have become less frequent in Germany of late years.

NAKATA (K.). **Accessory food substance in relation to growth of Bact. hyacinthi.**—*Ann. Phytopath. Soc. Japan*, ii, 4, pp. 339–349, 7 graphs, 1931. [Japanese, with English summary.]

An accessory food substance has been found to be essential to the growth of *Bacterium* [*Pseudomonas*] *hyacinthi* [see preceding abstract]. It is contained in the dead cells of *Bacterium solanacearum* and in the staled solution in which this organism has been grown, and to a lesser extent in oryzanin. The substance was denatured by filtration through filter paper and destroyed by heating at 100° C. for thirty minutes on three consecutive days. It is more readily soluble in water than in alcohol, and the author is inclined to regard it as identical with vitamin D. The amount of the accessory food substance (derived from oryzanin) requisite for the growth of *P. hyacinthi* in beef bouillon was found to be 3 per cent. In quantities above this percentage the substance exerted no further perceptible influence on the growth of the organism, the development of which, however, was arrested by its occurrence in lesser amounts.

STEINMANN (A.). **Overzicht van de ziekten en plagen van groenbemesters over 1930.** [Summary of the diseases and pests of green manures during 1930.]—*De Bergcultures*, v, 10, pp. 255–257, 1931.

This report on the diseases and pests of green manures in the Dutch East Indies during 1930 contains the following items of interest in addition to those already noticed from another source. In south Sumatra *Albizzia falcata* was attacked by *Fomes lamaoensis* and *Helicobasidium compactum* [*R.A.M.*, x, p. 299]. *Diplodia* sp. was very prevalent on *Albizzia* in south Sumatra and on the east coast, often in conjunction with *Rhizoctonia bataticola* (*Macrophomina phaseoli*), *F. lamaoensis*, and *Nummularia pithodes*; many young plants in old rubber plantations have died

during the last three years apparently from this cause. A species of *Diplodia* also caused heavy damage to *Derris microphylla* [*D. dalbergioides*] in Central Java.

Erythrina lithosperma was attacked in south Sumatra by *Xylaria thwaitesii*. *Leucaena glauca* in Central Java was destroyed by *F. lamaoensis*; damage to the same host from *Rosellinia arcuata* and *R. bunodes*, *F. lamaoensis*, *Ustulina maxima* [*U. zonata*: ibid., iv, p. 68], and *Armillaria fuscipes* [ibid., viii, p. 267] was reported from south Sumatra. *X. thwaitesii* and *F. lamaoensis* also occurred on *Cassia multijuga* in the same region.

Tephrosia candida in the rubber plantations of West Java was attacked by *Corticium salmonicolor*, *F. lamaoensis*, and *Nectria*; on the east coast of Sumatra by *Diplodia*; and in south Sumatra by *R. bunodes*. *Crotalaria usaramoensis* was infected in Malang by *R. bunodes* and in south Sumatra by *R. bunodes* (also on *C. anagyroides*), *R. arcuata*, and *Sclerotium rolfsii*.

MATSUURA (I.). **On two new diseases of White and Red Clover.** —*Journn. Plant Protect.*, xvii, 5 pp., 1 pl., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, pp. (67)–(68), 1931.]

The leaf spot disease of red and white clover caused by *Cercospora zebrina* [*R.A.M.*, x, p. 84] in Japan is characterized by the formation of purplish-brown lesions on the leaflets. The conidia on both surfaces of the spots present the appearance of a white mould.

The white spot disease of white clover (*Stagonospora compta*) may be recognized by the yellowish-white or pale greyish-green spots on the leaflets.

A species of *Brachysporium* is responsible for another disease of red and white clover.

PELTIER (G. L.) & TYSDAL (H. M.). **The relative susceptibility of Alfalfas to wilt and cold.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 52, 15 pp., 1931.

The results of the experiments briefly described in this paper, in which 62 imported (French and Turkestan) and local varieties of lucerne were tested, showed that among the imported varieties Provence F.P.I. No. 34886 gave very promising indications of resistance to bacterial wilt (*Aplanobacter insidiosum*) [*R.A.M.*, x, p. 192] and to cold, selections from this variety showing greater resistance to wilt than the original seed. Hardistan, recently described by Kiesselbach as a new variety, was also outstanding in wilt and cold resistance. Ladak, while showing some resistance, appeared to contain a larger number of susceptible individuals than either of the two first-named varieties. A few of the varieties recently introduced from Turkestan appeared to be even better than Hardistan in their resistance to wilt and to cold. All the local common varieties tested, regardless of their origin, were quite susceptible to wilt, and it is not thought advisable to plant Grimm, even though it is resistant to cold, in the subirrigated or irrigated sections of Nebraska [cf. ibid., x, p. 34].

Mills (W. D.). **A method of detecting and demonstrating early leaf infections of Apple scab.**—*Phytopath.*, xxi, 3, pp. 338–339, 1931.

Very good results in the detection and demonstration of apple scab [*Venturia inaequalis*] have been obtained at Cornell University, Ithaca, New York, by the use of cobalt paper. Filter paper is soaked in a 5 per cent. solution of cobaltous chloride and dried in the oven. A small press is made by fastening two lantern-slide cover glasses with a flexible hinge and attaching several layers of blotting paper to the inside of one of the slips with passe-partout strips. An apple leaf is placed on the blotting paper, a sheet of dry cobalt paper placed over the upper surface of the leaf, and the press closed and held with a pair of rubber bands. In a few seconds the blue paper turns white over the scab lesions owing to the increased water loss in the affected areas, so that a permanent record may be made by outlining the white spots. Prints may also be made from leaves still attached to the tree. For use in the field a small tin box was fitted with a calcium chloride container to keep the cobalt papers dry.

Staehelin (M.). **Der Schorfbefall des Lagerobstes.** [The scab infection of stored fruit.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xl, 5–6, pp. 113–116, 1931.

Notes are given on the occurrence of scab [*Venturia inaequalis*], both in its typical and atypical forms, on stored apples in Switzerland [*R.A.M.*, x, p. 320 and next abstract], and on experiments carried out to determine the method of infection by the fungus on the Winterzitrone and Franc Roseau varieties. The tests were conducted at a temperature range of 5° to 8° C. (the spores of the organism germinate between 3° and 30°) with 80 to 85 or 90 per cent. atmospheric humidity. Infection occurred with equal intensity on exposed apples and on those wrapped in tissue paper and packed in peat, showing that the disease is not due to spores in the storage room. Moreover, the development of infection was not prevented by washing the fruit in 70 per cent. alcohol to kill any spores adhering to the skin, and it is therefore concluded that the mycelium of the fungus is already present in the epidermis of the apples while still attached to the tree, becoming active under the favouring conditions of the storage room.

Rothe (G.). **Fusikladiumschaden an eingelagerten Früchten.** [*Fusicladium* damage on stored fruits.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 4, pp. 27–29, 2 figs., 1931.

The incidence of scab (*Fusicladium*) [*Venturia inaequalis*] among stored apples of the susceptible Winter-Glocken, Boiken, and Schur varieties in the Lower Elbe district of Germany was found to be much higher in untreated fruit and in that sprayed with lime-sulphur than where Bordeaux mixture or nosprasit at standard concentrations were used. Swiss investigations have shown that the fungus is probably present in the fruit before harvesting and storage [see preceding abstract], but under Lower Elbe conditions the possibility of spore infection in the warm, damp atmosphere of the storage rooms is by no means excluded.

Erni (W.). **Beobachtungen über die Bekämpfung von Krankheiten und Schädlingen an Obstbäumen im Jahre 1930.** [Observations on the control of diseases and pests of fruit trees in the year 1930.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xl, 5–6, pp. 83–87, 1931.

During 1930 the writer undertook some experiments to elucidate various problems of fruit pest control in Switzerland.

The application in the early part of April of a late dormant spray consisting of 10 per cent. lime-sulphur plus 0·5 to 1 per cent. iron sulphate was found slightly to delay the development of shot hole of cherries [*Clasterosporium carpophilum*] and of apple and pear scab [*Venturia inaequalis* and *V. pirina*] as compared with untreated trees [*R.A.M.*, ix, p. 790]. However, in seasons like 1930, characterized by frequent heavy showers in the early spring, this treatment cannot replace the pre-blossom application of 2 per cent. lime-sulphur and 0·1 per cent. iron sulphate or 2 per cent. lime-sulphur and 2 per cent. lead arsenate or lime arsenate.

The susceptible Boiken apple variety was completely protected against fruit scab by a late summer (early September) application of 2 per cent. lime-sulphur plus 0·1 per cent. iron sulphate in addition to the ordinary five treatments, which failed to secure entire freedom from infection.

Nosprasit (0·75 per cent.) was found to give equally good control of apple and pear scab and fruit moth [*Cydia pomonella*] with 2 per cent. lime-sulphur plus 2 per cent. lead arsenate [loc. cit.]. The Gravenstein and Charlamowsky apple trees receiving this treatment, however, suffered severely from leaf scorch, accompanied by partial defoliation and shedding of fruit. The fruit of all the apple trees treated with nosprasit further showed a corkiness of the skin, which was much less pronounced in Liegel's Winterbutter pear.

Good control of American gooseberry mildew [*Sphaerotheca mors-uvae*: ibid., vii, p. 103] was given by two applications of 3·5 per cent. soft soap solution (shortly before and after flowering), preceded by a dormant spray of 15 per cent. lime-sulphur and 1 per cent. iron sulphate.

Osterwalder (A.). **Erfahrungen in Sommer 1930 bei der Bekämpfung des Apfelschorfs und der Schrotschusskrankheit der Steinobstbäume.** [Experiences in the summer of 1930 in the control of Apple scab and of the shot hole disease of stone fruit trees.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xl, 5–6, pp. 93–105, 4 figs., 1931.

The results of a series of tests in the control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*] at Wädenswil, Switzerland, in 1930 showed that the protective action of 2·5 per cent. lime-sulphur plus 400 gm. lime arsenate per 100 l. of mixture was greater than that of the lime-sulphur alone [see preceding abstract]. Complete control, however, was effected only where the three early summer treatments were supplemented by two later applications in July and August.

Considerable damage was inflicted on apples by three applications of 1·5 per cent. Bordeaux mixture, as well as by cuprosan,

nosprasit, and nosprasen, and on cherries by two applications of 1 or 1·5 per cent. Bordeaux. The use of 1 per cent. Bordeaux mixture for the control of shot hole of cherries (*Clasterosporium carpophilum*) is recommended by the Lausanne Viticultural Experiment Station, where the different climatic conditions presumably render this treatment innocuous. This disease on cherries and on a damson tree was well controlled in the writer's tests by three spring applications (May) of 2·5 per cent. lime-sulphur. No benefit was derived from the addition to the mixture of 400 gm. lime arsenate per 100 l., the use of which against shot hole is regarded as extravagant and unnecessary. A dormant treatment was also found to be superfluous in the control of this disease.

RAWLINS (T. E.) & HORNE (W. T.). **'Buckskin', a destructive graft-infectious disease of the Cherry.**—*Phytopath.*, xxi, 3, pp. 331–335, 2 figs., 1931.

The Napoleon, Bing, Black Tartarian, Chapman, Oregon, and Rockport varieties of sweet cherry have been severely damaged in California during the last few years by a disease known as 'buckskin', to which Long Stem Bing appears to be resistant [*R.A.M.*, x, p. 323]. Affected fruits are more or less conical, with abnormally short pedicels, and fail to mature; just before ripening development ceases and the surface of the blossom end assumes a dull 'buckskin' appearance. The diseased fruits remain in this state for several weeks after the healthy ones have ripened, eventually becoming badly shrivelled. The symptoms generally appear first on a single limb or on adjacent ones, while in other cases the diseased fruits may be scattered over the tree; single spurs may even bear some healthy and some diseased cherries. In the early autumn the leaves on the affected parts of the tree assume an orange to maroon coloration along the base of the midrib and extending up the basal lateral veins. Diseased trees vary considerably in vigour, certain individuals remaining in apparently good health for some years, while others make little growth and may have small leaves or dead limbs. The Napoleon variety seems to suffer most from buckskin, especially on light soils. Once the disease has invaded an orchard the spread of infection is fairly rapid. For instance, one orchard showed 10 per cent. infection in 1929, while the average amount at the time of writing was 50 per cent. or more. Most of the infection seems to come from trees within a radius of about 50 yards.

No trace of a pathogenic organism has been revealed by microscopical and cultural studies of the diseased tissues. Experiments [the results of which are tabulated] in grafting Napoleon scions from affected trees into healthy young stocks led to the transmission of the disease in a high proportion of cases, distinct buckskin symptoms being observed in 12 out of 27 trees and slight manifestations in 6 others. All the fruit produced by the affected scions was diseased. Only in one case, however, did a diseased Black Tartarian scion transmit infection, although no difficulty was experienced in effecting transmission from diseased Napoleon scions to healthy Tartarian stocks and to healthy scions on healthy stocks to which diseased scions had been grafted. The maximum

distance between the scions in the latter case in which transmission was effected was 2 ft., and the time required for the appearance of symptoms in the originally healthy scion four months.

RIVES (L.). **Nouvelles observations sur l'apoplexie de l'Abricotier et de divers arbres fruitiers.** [Further observations on apoplexy of the Apricot and of various fruit trees.]—*Prog. Agric. et Vitic.*, xcv, 4, pp. 88-91, 1931.

In referring to his previous paper on the apoplexy disease of apricots in the Rhone valley [*R.A.M.*, viii, pp. 388, 452], the author states that an ungrafted apricot tree in the Botanic Garden of Toulouse which in 1928 had been inoculated with the bacterial organisms [a bacillus and a coccus], isolated by him from diseased trees, produced normal growth in 1929 but died suddenly in 1930, presenting all the symptoms typical of apoplexy. The lesions, however, did not extend farther down the trunk than the collar, this possibly indicating that the relative immunity of stocks is due rather to their underground position than to their relative resistance. An apple tree inoculated at the same time as the apricot had already perished during the preceding year, exhibiting similar symptoms.

Observations during 1929 and 1930 of numerous cases of apoplexy in an orchard of Burbank plums grafted on myrobolan [*Prunus divaricata*] showed that the diseased trees, usually grouped around well-defined infection foci, before dying exhibited preliminary pathological symptoms, namely, a yellowing, thickening, and brittleness of the already-formed leaves, and the subsequent development of stunted leaves disposed in dense tufts, the tissues of which were filled with motile, Gram-positive bacteria of varying length, which on agar gave rise to colonies very similar to those of the organisms previously described [loc. cit.]. Examination showed that infection had occurred either through mechanical injuries to the underground part of the trunk, in which case the primary symptom was a pathological alteration of the woody tissues; or through insect punctures in the aerial organs, when the primary symptom was a browning of the cortex and phloem. The former mode of infection appears to be the most common in apricots in the Rhone valley, and the latter in the Burbank plums studied.

While confirming his previous views in regard to the bacterial origin of apoplexy in apricots, the results of his further observations and especially the fact that his successive cultures, purified by passage through the apricot, have indicated that the small Gram-positive bacillus, measuring about 1·5 by 0·6 or 0·7 μ, is the cause of the disease, lead the author again to consider the possibility that the apricot apoplexy is related to fireblight (*Bacillus amylovorus*) [ibid., x, p. 319], the more so since a pear tree inoculated in 1928 with the apricot organisms has since developed symptoms very suggestive of the latter disease, without any discoloration of the cortex or phloem.

A measure of protection against the disease might be afforded by the antiseptic dressing of all wounds in fruit trees, taking

precautions to disinfect pruning implements when passing from a diseased to a healthy tree, and the like, but the early removal and burning of all diseased material in the orchards is considered to be the safest method of control.

GRAINGER (J.) & ANGOOD (EDITH). **The insect transmission of Raspberry mosaic.**—*Proc. Leeds Phil. & Lit. Soc.* (*Scient. Sect.*), ii, 4, pp. 183–184, 1 pl., 1 fig., 1931.

Unmottled wild raspberry [*Rubus idaeus*] plants from Craibstone, Aberdeen, were planted in a cool, insect-free greenhouse at Leeds, in August, 1927. All the shoots bore entirely unmottled leaves. In the summer of 1928, garden raspberries [*R. idaeus*] in the latter locality, every cane of which showed the symptoms of mosaic, were found to be heavily infested by *Aphis rubiphila*, and an experiment was conducted to determine the capacity of the insects for spreading mosaic [*R.A.M.*, viii, p. 184]. Twenty wingless female aphids were transferred from the diseased canes to two cages each containing one of the above-mentioned unmottled raspberry plants, ten insects being placed in each cage. After two months the plants in the cages were found to show the typical spotting of the leaves, which persisted when the raspberries were grown out-of-doors in the following spring. Since the control plants remained healthy, it is concluded that *A. rubiphila* is capable of transmitting raspberry mosaic in England [cf. ibid., viii, p. 731].

RANKIN (W. H.). **Virus diseases of Black Raspberries.**—*New York* (*Geneva*) *Agric. Exper. Stat. Tech. Bull.* 175, 24 pp., 1931.

The symptoms of five virus diseases of black raspberries [*Rubus occidentalis*] in the United States are described in popular terms, viz. leaf curl beta type [*R.A.M.*, x, p. 195], severe and mild streak, red raspberry mosaic, and yellow mosaic [ibid., viii, p. 731]. The three last-named are the most prevalent diseases in New York plantings, where red mosaic is particularly destructive. 'Mild mosaic' is considered to be merely a phase of red mosaic in which the necrotic symptoms accompanying this disturbance under certain conditions are suppressed [ibid., ix, p. 394]. The aphid *Amphorophora rubi* was shown by experiments on caged plants to be effective in the transmission of red mosaic from red [*R. idaeus*] to black and from black to black raspberries; it further conveyed yellow mosaic from black to black raspberries. This insect failed to transmit mild mosaic of the small yellow dot type or mild streak from black to black raspberries, while *Aphis rubiphila* [see preceding abstract] consistently gave negative results in these tests.

In the hope of standardizing the nomenclature of the virus diseases of raspberries, the writer here classifies them with their synonyms and gives descriptive notes on each.

KOCH (L. W.). **Spur blight of Raspberries in Ontario caused by Didymella applanata.**—*Phytopath.*, xxi, 3, pp. 247–287, 7 figs., 1 diag., 3 graphs, 1931.

Spur blight of raspberries, attributed in the United States to

Mycosphaerella rubina but referred in Europe, where it is usually called cane blight, to *Didymella applanata*, is stated to be increasing in prevalence in the Niagara Peninsula of Ontario [*R.A.M.*, x, p. 393]. The symptoms of the disease are described and its history in America and Europe outlined. Mature perithecia of the spur blight organism collected in Ontario were compared with those of the original material on which Peck's description of *M. rubina* (*48th Ann. Rept. New York State Museum*, Part I, 1894) was based. The two were found to be identical and paraphyses were present in both, so that the organism is a *Didymella* and not a *Mycosphaerella*. Cultures and naturally infected specimens of the spur blight organism from England agreed with Canadian material, and the identity of the latter with *D. applanata* was further confirmed by inoculation and reisolation experiments.

Descriptions are given of the perithecial and pycnidial stages of *D. applanata* (which macroscopically are hard to distinguish from one another) and of the results of inoculations with each stage. Perithecia of *D. applanata* developed on canes inoculated with cultures originating from ascospores, this stage being preceded by the formation of pycnidia of a species of *Phoma* [ibid., ix, p. 117]. The *Coniothyrium* sometimes found associated with spur blight and reported to be genetically related to *M. rubina* was shown to be the imperfect stage of *Leptosphaeria coniothyrium* [ibid., x, p. 117]. The most suitable medium for luxuriant growth and profuse sporulation of the *Phoma* stage of *D. applanata* was potato-dextrose agar. The growth range of the fungus was found to be unusually wide, viz., from 2° to 28° C. The pycnospores germinate in sterile distilled water in 18 hours at 23° to 24° and in 48 at 8° to 9°.

In 1929 the perithecia of *D. applanata* discharged their ascospores from 7th May to 7th July, a preliminary shower being apparently necessary for the process. Pycnospores of the *Phoma* stage were discharged at intervals together with the ascospores. The inoculation of both wounded and unwounded canes with ascospore suspensions of *D. applanata* gave positive results on the fruit spurs, tips of canes, and developing buds. The typical symptoms of spur blight further occurred on both injured and uninjured leaves inoculated with ascospore suspensions of *D. applanata* and pycnospore suspensions of the *Phoma* stage. The latter are the active agents of infection during most of the growing period of the canes.

Twenty-two raspberry varieties [which are enumerated] were found to be more or less susceptible to spur blight. Some degree of resistance was shown by Newman 23 and also by Columbian, a variety of the purple raspberry [*Rubus neglectus*]. The black varieties [*R. occidentalis*] appear to be moderately resistant to the disease. The Herbert, Idaho, Brighton, and Erskine Park (red) [*R. idaeus*] are highly susceptible to spur blight.

All regions of the host cortex, except the cork, were found to be freely penetrated by the mycelium, to the invasion of which the cork layers appear to be an effective barrier. Penetration of the phloem and deeper tissues was not observed. Perithecia of *D. applanata* were detected in the spring on bud scales infected the

preceding summer, and the direct infection of bud tissue, usually at the tip of the bud, was established; the outer bud layers are chiefly involved, the conducting tissues remaining free from mycelium.

Good control of the disease (average 80·4 per cent.) was obtained over a two-year period by one application in May of 3–5–40 Bordeaux mixture plus 2 lb. whale-oil soap.

MARKIN (FLORENCE L.). **Notes on Blueberry diseases in Maine.** —*Plant Disease Reporter*, xv, 2, pp. 11–13, 1931. [Mimeographed.]

Popular notes are given on some common diseases of blueberry (*Vaccinium* spp.) observed in Maine during the summers of 1929 and 1930. Witches' broom (*Calyptospora columnaris*) was found to be causing heavy damage (up to 100 per cent. infection) on *V. pennsylvanicum* and *V. corymbosum* in fields surrounded by woods, while *V. caespitosum*, *V. canadense*, *V. uliginosum* (a new host), and the mountain cranberry (*V. vitis-idaea*) [red whortleberry or cowberry] are also susceptible. The aecidial stage of the rust occurs on *Abies balsamea*.

Leaf rust (*Pucciniastrum myrtilli*) [*R.A.M.*, vi, p. 303] is generally distributed, occurring at a distance of up to at least a quarter of a mile from woodlands. *V. canadense*, *V. corymbosum*, *V. pennsylvanicum*, *V. uliginosum*, and huckleberry (*Gaylussacia baccata*) are liable to infection by *P. myrtilli*, the aecidial stage of which is found on *Tsuga canadensis*.

Red leaf spot (*Exobasidium vaccinii*) [ibid., ix, p. 389] causes a brilliant red coloration of blueberry foliage (*V. corymbosum*, *V. pennsylvanicum*, and *V. canadense*) in June and July, when white masses of mycelium and spores are produced on the under surfaces. Defoliation rapidly follows spore formation, but leaf infection persists throughout the season. On *G. baccata* hypertrophy of the blossoms, small fruits, and twigs is caused by *E. vaccinii*, in addition to leaf infection. *E. vaccinii* is also found on *V. vitis-idaea*, *Andromeda glaucophylla*, and *Rhododendron canadense*. This disease is partially controlled by the practice of burning over the plants about every third year.

In 1929, when the weather in May was cold and wet, severe damage was caused by twig blight and fruit rot due to a species of *Sclerotinia* which infected *V. canadense*, *V. corymbosum*, and *V. pennsylvanicum*; only the fruit rot stage was observed on the large cranberry (*V. macrocarpon*).

During a week of warm, foggy weather in June, 1930, a species of *Botrytis* proved very destructive on the blossoms, small fruits, twig tips, leaves, and stems of *V. canadense*, *V. corymbosum*, and *V. pennsylvanicum*. Infection apparently originated in the corolla, whence it progressed downwards into the fruit.

Mildew (*Microsphaera alni* var. *vaccinii*) commonly causes early defoliation, being most severe on *V. pennsylvanicum* var. *nigrum* but occurring also on *V. corymbosum*, *V. canadense*, *V. pennsylvanicum*, and *G. baccata*.

SMITH (F. E. V.). **Experimental work on killing roots of Bananas with chemicals.**—*Journ. Jamaica Agric. Soc.*, xxxv, 3, pp. 118–119, 1931.

To obviate the necessity of digging out banana roots in the eradication of Panama disease [*R.A.M.*, x, p. 43] and so disseminating soil infected with *Fusarium cubense* the author has devised a method of killing the roots *in situ*. This consists in cutting down the main stem and suckers to within 6 in. of the soil and applying heavy gas oil (sp. gr. 0·856 at 60° F., flashpoint P.M. 180° F.) to the cut surfaces and the soil surrounding the suckers. The quantity necessary to kill the tree varies from 1 to 4 pints. The material cut down is cut into pieces and treated with lime.

The local price of the oil is $4\frac{1}{2}d.$ per gall., so that the cost of treating an average plot of nine roots works out at about 1*s.* 6*d.* for the oil plus the cost of labour, which is very considerably less than that entailed in digging out. The method can also be applied however wet the weather, and by giving a kill of nearly 100 per cent. it eliminates the trouble and expense of suckering.

GOETZE (G.). **Untersuchungen über Obstbaumkarbolineum. B) Physiologischer Teil.** [Investigations on fruit tree carbolineum. B) Physiological section.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxiii, 8–14, pp. 136–164, 1 fig., 1 graph, 1931.

A tabulated account is given of the writer's investigations at Landsberg a.d.W. on the composition, insecticidal value, action on plants, and other features of various types of fruit tree carbolineum [*R.A.M.*, ix, p. 764 *et passim*].

HOERNER (G. A.). **Bentonite sulphur—a material of merit for the Pacific Coast.**—*Better Fruit*, xxv, 8, pp. 22–23, 1931.

Bentonite sulphur, prepared by fusing fluid sulphur into bentonite [*R.A.M.*, x, p. 197], though relatively non-caustic is ten times as toxic as any ordinary form of sulphur, is effective at lower temperatures, mixes readily with lime, spreaders, or insecticides, is more adhesive than sulphur, and is ultimately cheaper as an equal amount will cover a far greater area of foliage.

In its natural condition bentonite (a colloidal clay of volcanic ash formation found in Wyoming and Montana) is composed of laminated particles estimated at $\frac{1}{250,000}$ in. [0·1 μ] in diameter. Sulphur when fused with bentonite at a high temperature appears to be absorbed between the layers and thus becomes so finely divided that the probable diameter of the sulphur particles is conservatively estimated at 0·000001 in. [0·025 μ]. In the commercial form of the material the particles are an aggregate of thousands of the minute units, the aggregate being broken down into its integral parts by the addition of water.

Pointing out that there is much evidence to show that the degree of fineness and the toxicity of sulphur are correlated [ibid., ix, p. 734], the author states that it is the fusing of the sulphur into the bentonite that gives the former its superior fungicidal value. The vastly greater adhesiveness of bentonite sulphur as compared with ordinary sulphur is due not only to its being

naturally sticky and gelatinous but to the fact that being a colloid of the irreversible type, it does not readily wash off. It is equally effective on wet or dry foliage and though originally used as a dust it makes, owing to its suspensibility and high toxicity, a summer spray of extraordinary value. It successfully controls rust diseases of ornamental plants, such as hollyhocks [*Puccinia malvacearum*], snapdragons [*P. antirrhini*], carnations [*Uromyces caryophyllinus*], and asters [*Coleosporium solidaginis*], it is recommended for the control of peach leaf curl [*Taphrina deformans*], and it kills the spores of celery blight [*Septoria apii*].

HURT (R. H.). **The waste sulphite material of paper mills as an adjuvant to certain spray materials.**—*Virginia Agric. Exper. Stat. Bull.* 277, 10 pp., 1 fig. [on cover], 1931.

The author claims that the waste by-product of paper mills derived from the digestion of wood lignin with calcium bisulphite solution and known as lignin or sulphite pitch [the chemical composition and properties of which are indicated], has been shown to be the best and cheapest emulsifier and suspending agent available at the present time for the preparation of certain insecticidal and fungicidal sprays. Emulsions made with it are very stable and can withstand very low temperatures without breaking down. Directions are given for the preparation of stock emulsions, and it is recommended to store them in wooden containers, in which they may be kept for an indefinite time if properly made. They are miscible in any proportion with lime-sulphur solutions, soluble sulphur, and Bordeaux mixture. The powdered form of the material is an excellent wetting and suspending agent for dry-mix sulphur-lime, in which it may be substituted weight for weight for calcium caseinate; the best formula has, however, been found to be 50 lb. dusting sulphur, 42 lb. hydrated lime, and 8 lb. powdered lignin pitch. In spray solutions, 1 lb. of the powder or 1 quart of the liquid form to 50 gallons of the solution is usually sufficient as a suspending and wetting agent, but the dose may be doubled without injury to the plants.

In indicating the sources from which the material may be obtained, and the various trade names under which it is known, it is stated that the different brands are about the same in chemical composition and other properties, the slight differences that may occur being without material importance so far as their value as emulsifiers and suspending agents is concerned.

FONZES-DIACON. **Rôle physique et chimique des rayons ultra-violets sur le soufre sublimé. Action du soufre sur l'Oïdium.** [Physical and chemical action of ultra-violet rays on sublimed sulphur. Action of sulphur on *Oidium*.]—*Prog. Agric. et Vitic.*, xcv, 7, pp. 155–158, 1931.

The author states that experiments, in which flowers of sulphur was subjected to the prolonged action of direct sunlight inside ordinary glass and quartz glass flasks, showed that while ultra-violet rays exerted a certain photochemical action on the sulphur, inasmuch as they slightly increased its oxidation, they had no effect on its volatilization, which was practically the same in both

kinds of glass. These results are considered by him to support the view that the fungicidal action of sulphur dust on the vine *Oidium* [*Uncinula necator*] is chiefly due to the emission by it, even at relatively low temperatures, of sulphur vapour [*R.A.M.*, viii, p. 514], and not to the formation from it of sulphur dioxide or pentathionic acid [ibid., ix, p. 734], both of which were shown to be formed very slowly and in very small quantities even under optimum conditions.

[This paper is also published in *Comptes rendus Acad. d'Agric. de France*, xvii, 9, pp. 301–306, 1931.]

RIEHM (E.). **Gesundheitsschädigungen durch Beizmittel.** [Injury to health from disinfectants.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 3, pp. 19–20, 1931.

Attention is drawn to the occurrence in Germany of several cases of more or less severe injury to health following the handling during application of fungicidal dusts without proper precautions. In four of the cases officially investigated by the Biologische Reichsanstalt, the disturbances were medically certified to be due to the inhalation of mercury-containing dusts. Protection from the noxious fumes of these preparations is given by respirators, which are supplied by various firms, including C. Goerg & Co., Berlin C. 2, Neue Friedrichstr. 47 (Schutzmaske Nr. 18); Deutsche Gasglühlicht-Auer-Gesellsch., Berlin O. 17 (Degea Respirator Nr. 210); and Cloetta & Müller, Stuttgart, Kronprinzenstr. 36 (Lungenheil). In experiments with tillantin, conducted by the German Plant Protection Service, good results have been given by moistening the seed-grain, after treatment in an intermittently working apparatus, with water (0·5 l. per cwt.), followed by one to two minutes' further turning of the machine; the latter can then be emptied without releasing a cloud of dust.

GLEISBERG (W.). **Bedeutung und Notwendigkeit der Prüfung von Pflanzenschutzgeräten.** [Importance and necessity of the testing of plant protection apparatus.]—*Obst- und Gemüsebau*, lxxvii, 8, pp. 41–45, 10 figs., 1931.

Notes are given on the work of the newly established Laboratory for Plant Protection Apparatus at Pillnitz [Saxony] in the testing of the various classes of spraying machines and other apparatus employed in the control of fungous and insect pests of agricultural crops.

WOLFF (H.). **Erfahrungen bei Fassadenbemalung.** [Experiences in connexion with façade painting.]—*Farbe und Lack, 1931*, 9, pp. 99–100, 6 figs., 1931.

Of recent years many cases of damage to painted cement façades in Germany through the action of *Aspergillus niger* have been observed [cf. *R.A.M.*, i, p. 276]. The fungus makes extraordinarily rapid growth under humid conditions and in a few weeks the façade may be covered with black, brown, or reddish spots which expand and merge, finally spreading over the entire surface.

DOYER (L[UCIE] C.). **Untersuchungen über den Gesundheitszustand des Saatguts.** [Investigations on the state of health of seeds.]—Reprinted from *Comptes rendus Assoc. Internat. d'Essais de Semences, 1930*, 13–14, 41 pp., 1930. [English summary. Received June, 1931.]

In connexion with the forthcoming International Seed Testing Congress to be held at Wageningen, Holland, in the summer of 1931, the author presents a scheme of classification of the various types of seed injury, including infection by parasitic fungi and virus diseases, some important examples of which are discussed [*R.A.M.*, x, p. 327].

TUBEUF [C. v.]. **Der praktische Fall in der Pathologie.** [The practical attitude in pathology.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 3, pp. 115–127, 2 figs., 1931.

Some general observations, supplemented by concrete examples from the author's personal experience, are made on the necessity of combining scientific attainments with practical knowledge in phytopathology and the kindred subjects of agricultural chemistry, soil science, meteorology, silviculture, agriculture, and horticulture [cf. *R.A.M.*, i, p. 114].

VAN POETEREN (N.). **De Plantenziektenkundige Dienst in Nederland.** [The Phytopathological Service in the Netherlands.] —*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 36, 66 pp., 11 figs., 1931.

This is a revised version of the author's earlier account of the history, organization, and activities of the Dutch Phytopathological Service [*R.A.M.*, iv, p. 257].

BEWLEY (W. F.). **The nature of the virus principle in mosaic disease.**—*Nature*, cxxvii, 3203, p. 442, 3 figs., 1931.

Superficially sterilized pieces of tomato stem from plants with mosaic and 'stripe' symptoms [*R.A.M.*, x, p. 64] were found, in the twelfth week after insertion into tubes of potato agar, to be surrounded by a greyish-brown bacterial growth. Stained smears showed small clear areas at a magnification of 150, and at 1,250 it was apparent that the bacterial cells had been destroyed, leaving a granular deposit with deeply staining fragments closely resembling minute organisms. At other portions of the smears certain cells were observed to be much swollen and speckled with minute, darkly staining granules. Cultures of the original growth were emulsified with water and passed through a sterile Chamberland *L* 3 filter. When added to a broth culture of the original growth freed as far as possible from 'phage', a slight clearing and diminution of the number of bacteria followed.

Thinking that the bacteriophage principle present in the cultures might be the active virus of mosaic residing in the tomato tissue from which the isolations were prepared, the author extracted a quantity of virus from a plant originally inoculated with the aucuba mosaic virus [ibid., x, p. 135] that had subsequently also developed stripe symptoms. Portions of the virus that had passed through *L* 3, *L* 5, and *L* 7 filters under aseptic conditions were

tubed separately and added in 1 c.c. lots to turbid potato broth cultures of the original growth freed as far as possible from phage. In 24 hours the tubes receiving filtrates from the *L* 3 and *L* 5 filters showed slight clearing, followed after another 24 hours by definite clearing; in some cases very slight clearing and browning occurred where the filtrate from an *L* 7 filter was added. The microscopic examination of drops from the cultures showed an appreciable diminution of bacterial numbers accompanied by apparent fragmentation on the addition of filtrates from the *L* 3 and *L* 5 filters. Potato broth tubes to which *L* 3 filtrate of healthy tomato juice was added remained turbid and showed no decrease in bacterial numbers or change of form. The action of the virus seems to be limited to certain organisms, since no clearing or browning resulted when it was added to mixed broth cultures prepared from soil and horse manure.

These results, which were obtained repeatedly, suggest that the principle causing tomato mosaic is of the bacteriophage type; it evidently enters the plant with the organism it parasitizes in nature, becomes adapted to life within the tomato tissues, and produces the symptoms associated with mosaic disease.

SCHAFFNIT (E.) & MÜLLER (W.). **Untersuchungen über Viruskrankkeiten (10. Mitteilung.) Wechselseitige Virusübertragungen innerhalb der Familie der Solanaceen.** [Investigations on virus diseases. (Note 10.) Reciprocal virus transmissions within the family of the Solanaceae.]—*Phytopath. Zeitschr.*, iii, 2, pp. 105–136, 18 figs., 1 diag., 1931.

During 1927 and 1928 the writers were engaged on investigations and experiments [the results of which are fully discussed and tabulated] on the inter-transmissibility of mosaic and other virus diseases of tobacco, potato, and tomato to other members of the Solanaceae [cf. *R.A.M.*, vii, p. 190].

The following viruses were used in the tests: mosaic and streak necrosis of tobacco and tomato, and mosaic, leaf curl mosaic ['Kräuselmosaik'], aucuba mosaic, and streak necrosis of potato. Transmission was effected by needle injections, by rubbing the sap or tissue emulsions of diseased plants on to the crushed areas of healthy leaves, and by grafting.

Streak necrosis of tobacco, which occurred spontaneously in the field and on pot plants at the Bonn-Poppelsdorf Agricultural College, is characterized by stunting of the plants and a brown discoloration of the base of the midrib of half-grown leaves, sometimes extending the whole length of the midrib and involving the lateral veins and intercostal areas. The stem of affected plants often develops stripes which deepen into furrows through the collapse of the tissue. Even the flowers may be attacked, with the result that seed production is prevented. This appears to be the first report of streak necrosis of tobacco, though it is believed by the authors to be only a severe type of tobacco mosaic occurring under certain conditions not yet completely understood.

The following plants proved susceptible to this disease: tobacco (*Nicotiana rustica*), tomato, *Solanum nigrum*, *S. humile*, *S. villosum*, *Hyoscyamus niger*, *Datura stramonium*, and *Nicandra*

physaloides. On tobacco the disease normally assumed the form of streak necrosis, the typical mosaic spots developing only in the winter. *S. nigrum*, *S. humile*, and *S. villosum* developed scattered, irregular, pale green spots, with numerous swellings; a strong tendency to masking was observed. The symptoms on *D. stramonium* were inconspicuous. *H. niger* showed large, almost white spots and pronounced swellings of the dark green area, frequently accompanied by changes in the shape of the leaf. On *N. physaloides* the symptoms are variable, sometimes consisting in a slight discoloration of the leaf blade with blue-green mottling, while in other cases the leaf may show a pronounced, uniform discoloration, stunting, and curling of the margin, with brownish-black, necrotic dots. Streak necroses may also develop on the stem and calyx leaves.

Tomato mosaic was found to be transmissible to potato, tobacco (*N. tabacum* and *N. rustica*), *S. nigrum*, *S. humile*, *S. villosum*, *D. stramonium*, *H. niger*, and *Nicandra physaloides*, all of which developed similar symptoms to those induced by inoculation with tobacco mosaic.

Mosaic and leaf curl mosaic ['Kräuselmosaik'] of Industrie potatoes were transmissible to tomato, *S. nigrum*, *S. humile*, *S. villosum*, *D. stramonium*, *H. niger*, and *N. physaloides.* The symptoms on tomato were extremely slight and became masked in the later stages. On the three species of *Solanum* the symptoms induced by the leaf curl inoculations were somewhat more pronounced than those with mosaic. On *H. niger*, unlike the other plants tested, the symptoms induced by inoculation with potato mosaic and leaf curl differed completely from those caused by the tobacco and tomato viruses. Numerous pale dots appeared on the leaf and gradually expanded into irregular, indefinite areas, scarcely discernible in the later stages. The results of the tests on *Solanum*, while not conclusively proving that the potato mosaic and leaf curl mosaic viruses are distinct, in opposition to the view that leaf curl is merely an intensification of mosaic, do certainly point in this direction.

Aucuba mosaic on the Erstling [Duke of York], General von Werder, and Juliniere potato varieties [ibid., ix, p. 764] was characterized by the rapid disappearance of the symptoms. Transmission experiments by means of grafting led to infection of the stocks in a few cases but the scions remained healthy.

Streak of potatoes was transmissible by rubbing to potato, tomato, tobacco (*Nicotiana tabacum* and *N. rustica*), *S. nigrum*, *S. villosum*, *S. humile*, *H. niger*, *D. stramonium*, and *Nicandra physaloides*, the incubation period being only 20 days.

It was further shown by these experiments that tobacco mosaic is transmissible to tomato but causes no symptoms on potato, even after passage through tomato; that potato mosaic cannot be transmitted to tobacco either directly, or indirectly through the tomato; and that tomato mosaic is transmissible both to tobacco and potato. These data point to the existence of three distinct viruses, viz., that of tobacco, readily transmissible to tomato but not to potato, though the latter may act as a symptomless carrier between tobacco and tomato; that of potato, transmissible to

tomato but not to tobacco; and that of tomato, transmissible both directly and indirectly to tobacco and potato.

In a series of grafting tests it was found possible to transmit infection from a diseased tobacco stock to a healthy tomato scion with *Atropa belladonna* as an intermediate stock [cf. ibid., ix, p. 604]; from a diseased to a healthy tomato with the same intermediate stock; from diseased tobacco to healthy tomato with *Lycium halimifolium* as an intermediate stock; from a diseased to a healthy tomato with *L. halimifolium* as an intermediate stock; and from diseased tobacco or tomato to healthy tomato with *S. dulcamara* as an intermediate stock. It was found that the incubation period of the virus increased with the length of the intermediate stock up to 50 cm., beyond which no infection took place. The inoculation of tobacco plants with material (*a*) from the main shoot and (*b*) from the lateral shoots and leaves of the intermediate stock, *S. dulcamara*, showed that the former was the chief seat of the virus, producing infection in six out of eight plants, while with material from the latter source only two plants became diseased after lengthy periods. It was shown by comparative experiments with the expressed juice of diseased tobacco and that of the intermediate stocks, *A. belladonna* and *S. dulcamara*, that the virulence of the virus is not impaired by protracted contact with the juice of these plants.

Petri (L.). **Le variazioni a salti (saltations) dei microrganismi ed il loro significato biologico.** [Saltations in micro-organisms and their biological significance.]—*Atti II° Congr. Naz. Microbiol.*, Milan, *1930*, pp. 13–48, 1930.

After briefly referring to the specialization on different hosts shown by the various races or forms of one and the same species of fungus, noting the importance of this in the question of control by growing resistant varieties, and pointing out that new light has been shed upon the whole problem by the discovery of sexual heterothallism in fungi, saltation, the cyclogenic phases of many bacteria, and the variations induced by D'Hérelle's bacteriophage [*R.A.M.*, ix, p. 363], the author discusses in some detail recent researches by numerous workers into the problems of saltation and variation in fungi [ibid., ix, p. 493 *et passim*]. In the second part special reference is made to the various opinions now prevalent as to the genetic nature and biological significance of more or less permanent variations occurring in cultures made from a single spore or clone.

Most so-called saltations in colonies of micro-organisms are brought about by variations consisting in the sudden segregation of races differing from the original form but whose origin cannot be definitely attributed to the somatic disjunction of a heterozygous form, to the dissociation of mixochimaeras [ibid., x, p. 238], or to vegetative mutations. Whether these variations are something deeper than vegetative mutations or whether they are in fact such, they yet derive from changes in internal factors, and through them races, forms, and strains originate having characters diverging from those of the original form.

In discussing the relation existing between the complex of

different forms which makes up a given species and systematics, the author states that where very variable conidial forms exist it would be best, from a systematic point of view, to concentrate on a study of the corresponding perithecial or basidiophoral form.

CURZI (M.). **Su la mutazione di un ifomicete (Fusarium moronei).** [On the mutation of a Hyphomycete (*Fusarium moronei*).]—*Atti II° Congr. Naz. Microbiol.*, Milan, *1930*, pp. 49–52, 1930.

By selecting transfers of sectors of a monoconidial culture of *Fusarium moronei* [*R.A.M.*, ix, p. 184] the author obtained a number of non-reversible strains; one of these, referred to as strain α, was secured by selecting through several generations the sector having the most profuse aerial mycelium, while another, referred to as strain γ, was obtained by similarly selecting the sector with the scantiest aerial mycelium.

A comparative study of these two strains disclosed substantial differences in their cultural characters, morphology, and physiology. Strain α showed abundant aerial mycelium and sporodochial fructification, whereas strain γ had no or very sparse aerial mycelium and sporulated solely by means of pseudo-pionnotes; strain α showed sclerotia and coloured, echinulated chlamydospores arranged in numerous, variously shaped clusters, while the γ strain had only hyaline, smooth, intercalary chlamydospores.

When grown together the two strains exhibited strong mutual antipathy, a dark line of branched, abnormally contorted hyphae, with very abundant aerial mycelium and active sporulation forming a boundary line between the two colonies. This antipathy, only weakly present on poor media, was very marked on media rich in carbohydrates.

The systematic positions of the two strains in the genus *Fusarium* are different though neither is outside the limits of the section *Gibbosum*; strain α is placed in the subsection *Ferruginosum* while the γ strain falls into the subsection *Eugibbosum* very near to *Fusarium falcatum*.

MATSUURA (I.). **Experimental studies of the saltation in fungi. (Preliminary report.) I. On the saltation of Ophiobolus miyabeanus Ito et Kuribayashi parasitic on Rice plant. I.** —*Trans. Tottori Soc. Agric. Sci.*, ii, pp. 64–82, 1 pl., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, p. (68), 1931.]

In monospore cultures of three conidial (*Helminthosporium*) strains of *Ophiobolus miyabeanus* isolated from rice [see above, p. 482], the black mycelium was transformed in patches or even wholly into white, the modified coloration either persisting for further generations (saltation) or reverting to its original state (fluctuation). Saltations were found to occur on any of the nutrient media used but were much more frequent on potato decoction agar than on apricot decoction agar. A positive correlation was further observed between length of cultivation and frequency of saltation.

Matsuura (I.). **Experimental studies on the saltation in fungi. (Preliminary report.) II. On various types of saltations.**—*Journ. Plant Protect.*, xvii, 7 pp., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, p. (68), 1931.]

Four types of saltation, represented by the transformation of black into white mycelium, were distinguished by the author, viz., (1) island type: the mycelial patches of saltants appear scattered over the original mycelium, as in the *Helminthosporium* stage of *O. miyabeanus* [see preceding abstract]. (2) Fan-shaped type, in which fan- or wedge-shaped mycelial patches of the saltant are produced, e.g., *Brachysporium* sp. [*R.A.M.*, vii, pp. 54, 267]. (3) All-saltating type, characterized by a complete change of the original mycelium, as in *Alternaria sonchi.* (4) Ever-saltating type, in which the original fungus, after a certain period of growth, produces the saltant in every generation, as in the case of an Ascomycete on pears.

Matsuura (I.). **Experimental studies on the saltation in fungi. (Preliminary report.) III. On the saltation of the helminthosporiose fungus of Rice plant, Ophiobolus miyabeanus Ito et Kuribayashi. II.**—*Journ. Plant Protect.*, xvii, 16 pp., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, pp. (68)–(69), 1931.]

A comparative study of the *Helminthosporium* stage of *Ophiobolus miyabeanus* and its saltant [see preceding abstracts] showed that the mycelium of the latter is white and slender, producing no spores, while that of the former is dark brown to black and thick. The colour of both remains constant on various nutrient media. At 28° C. the mycelium of the saltant remains white, but above or below this point the black coloration reappears. When the fungi are grown in Knop's solution with saccharose, the hydrogen ion concentration and osmotic pressure of the solution are both increased. Considerable differences in pathogenicity were found to exist between the original fungus and its saltant.

Matsuura (I.). **Experimental studies on the saltation in fungi. (Preliminary report.) IV. On the saltation of Ophiobolus miyabeanus Ito et Kuribayashi parasitic on Rice plant. III.**—*Agric. & Hort.*, v, pp. 1477–1496, 4 pl., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, p. (69), 1931.]

When exposed to X-rays, *Ophiobolus miyabeanus* shows no change in its saltating capacity [see preceding abstracts], but under the action of ultra-violet rays, especially in combination with X-rays, the percentage of saltations is greatly reduced, and the saltants neither revert to the original state nor produce any new saltants. The occurrence of saltation is very dependent on temperature and also on the composition of the nutrient media.

Matsuura (I.), Yosida (M.), Kaneda (Y.), & Kotani (E.). **Experimental studies on the poisonous action of metabolism products of fungi against plants.**—*Agric. Res.*, xiv, pp. 258–263, 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, p. (69), 1931.]

Cut stems of *Vicia faba* placed in the sterilized filtrate of the

Helminthosporium stage of *Ophiobolus miyabeanus* and of *Brachysporium* sp. isolated from rice [see preceding abstracts] shrivelled rapidly and generally failed to recover when transferred to fresh water. The toxicity of the solution was not destroyed by 10 minutes' heating at 100° to 126° C. under a pressure of 1 to 5 atmospheres, or by the use of nutrient solutions in which nitrites are not produced, e.g., asparagin. When the nutrient solution is filtered through a collodion membrane, the colloidal residue remains unchanged in its action and the crystalline filtrate produces many pathogenic spots on the leaf surface. When the carbohydrate-nitrogen ratio of the nutrient solution was altered by increasing the nitrogen to twice, four, or eight times that of the standard, while the carbon content remained constant, the toxic action was found to be much increased.

Certification of Potatoes in respect of health as well as purity.—*Journ. Scottish Chamber of Agric.*, xii, 2, pp. 122–123, 1931.

At a meeting on 12th February, 1931, between representatives of the Highland and Agricultural Society, the National Farmers' Union of Scotland, the Scottish Chamber of Agriculture, various potato trade associations, and the Department of Agriculture for Scotland, an agreement was reached to postpone the certification of seed potato crops with reference to disease at any rate until 1932. It was decided that for the 1931 crop the Department should, if possible, extend the inspections for disease, and that the inspectors should notify farmers of the requirements in this respect which may be enforced in future years. Regarding the proposed certificate, it was agreed that 5 per cent. of disease should be the maximum allowed, the detailed maximum percentages for leaf roll and mosaic to be adjusted next year. It was further agreed that blackleg [*Bacillus phytophthorus*] should not be included in the detailed percentages, and that a certificate should only be refused on account of this disease where an abnormal percentage of infection is found in the crop.

Wiant (J. S.). **Potato seed treatment with formaldehyde dust for the control of scab.**—*Amer. Potato Journ.*, viii, 4, pp. 101–104, 1931.

Significant increases in yield and a marked reduction in the incidence of scab [*Actinomyces scabies*] were given in 1929 and 1930 in Wyoming by dusting the tubers before or after cutting with the formaldehyde dust, smuttox [*R.A.M.*, x, p. 362], at the rate of 1½ or 3 oz. per bushel. This treatment (3 oz. per bushel) applied before cutting compared favourably with the standard method of immersion in hot formaldehyde (1 in 120) for scab control, and further appears to be effectual against blackleg [*Bacillus phytophthorus*].

Wartenberg (H.). **Zur Biologie der Kartoffel. VI. Mitteilung. Beitrag zur Kenntnis des ökologischen Abbaues der Kartoffel.** [On the biology of the Potato. Note VI. Con-

tribution to the knowledge of the ecological degeneration of the Potato.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 4, pp. 405–423, 12 figs., 1 diag., 1 graph, 1931.

In this paper, which forms part of the series of observations carried out under Merkenschlager on various aspects of the biology of the potato [*R.A.M.*, ix, p. 122], the writer discusses the etiology of ecological degeneration [cf. ibid., x, pp. 123, 265]. This term is defined as the tendency of the plant to produce a diminished yield as the result of changed ecological conditions, involving constitutional modifications and the simultaneous acquisition of liability to infectious diseases.

The most plausible hypothesis of the cause of ecological degeneration would appear, from these investigations, to lie in the excessive use of potash which, while giving a temporary stimulus to high yields, is absorbed in increasingly large quantities by each successive generation and ultimately leads to extensive modifications in the physico-chemical condition of the protoplasm of the plant.

Merkenschlager (F.) & Klinkowski (M.). **Zur Biologie der Kartoffel. VII. Mitteilung. Der Rückzug der Kartoffelsorte Magnum bonum nach Skandinavien im Lichte der ökologischen Abbautheorie.** [On the biology of the Potato. Note VII. The retreat of the Potato variety Magnum Bonum into Scandinavia in the light of the ecological degeneration theory.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 4, pp. 431–463, 1 fig., 1931.

The history of the Magnum Bonum potato variety is traced from its introduction into Germany from England in 1876 to the present day. Owing to its susceptibility to leaf roll under German conditions, the popularity of this variety has steadily declined since 1905 and its cultivation has been largely discontinued. In Scandinavia, however, where the environmental factors are more uniformly favourable to it, Magnum Bonum is stated to be flourishing. These facts are considered by the writers in the light of the ecological degeneration theory [see preceding abstract]. A special section by E. Klapp is devoted to the position of the variety in Thuringia.

The bibliographical references and notes occupy nine pages.

Wachs. **Ergebnisse fünfjähriger Kartoffelsortenversuche der Versuchsfelder im Havelluch.** [Results of five years' Potato varietal tests in the experimental plots in the Havelluch district.]—*Mitt. Ver. Förderung Moorkult. im Deutschen Reiche,* xlix, 4, pp. 79–86, 1931.

The following items are of interest in this account of five years' experiments (1926–30) with a number of potato varieties in the Havelluch district [Brandenburg, Prussia]. Ackersegen (medium-late) is immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, x, p. 53] and resistant to late blight [*Phytophthora infestans*]. Erdgold (medium-late) is also immune from wart disease and resistant to scab [*Actinomyces scabies*: ibid., ix, p. 553], but the foliage is somewhat susceptible to late blight.

Edeltraut (medium-late) is susceptible to both wart disease and scab. Prozentragis (medium-late) is susceptible to all three above-mentioned diseases. Neither Rotkaragis (medium-late) nor Wohltmann (late) is immune from wart, but the latter showed fair resistance to late blight. Parnassia (medium-late) is immune from wart disease, fairly resistant to late blight, and susceptible to scab.

SEMSROTH (H.). **Die Abstammung der deutschen krebsfesten Kartoffelsorten.** [The derivation of the German wart-immune Potato varieties.]—*Fortschr. der Landw.*, vi, 6, pp. 195–197, 1931.

Notes are given on the derivation of some standard German potato varieties immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, x, pp. 53, 204], their ancestry and other particulars also being shown in a table.

Four parent varieties in particular appear to act as transmitters of immunity, viz., Jubel (Richter), Lech and Topas (Dolkowski), and Jos. Rigault (Richter). Jubel is represented in the parent generation of 11 varieties, among the grandparents of 17, and among the great-grandparents of one; it is thus the progenitor of 29 out of the 54 varieties the ancestry of which is known. Among the varieties descended from Jubel are Parnassia, Pepo, Arnika, and Beseler, derived from a cross between Jubel and Deutsches Reich. Hindenburg (a cross between Ismene and Jubel) is also, like the latter, resistant to scab [*Actinomyces scabies*]. Jubel and Industrie are the parents of Erdgold, Cellini, Maibutter, Gneisenau, Max Delbrück, and Paul Wagner. The Albabona, Berlichingen, Franz, Rosafolia, and Sickingen varieties spring from a cross between Centifolia and Pepo. The parents of Modrow's Blaupunkt are Parnassia and Industrie, those of Cepa Parnassia and Centifolia, those of Glückauf and Kleinod Fürstenkrone and Parnassia, and those of Palma Parnassia and Alma. Wekaragis is derived from a cross between Beseler and Kuckuck, and Berolina from Cellini × Centifolia. A cross between Lech and Halka produced Danusia, Lech × Frühe Rosen, Tannenberg, and Industrie × Lech, Direktor Johanssen and Preussen. Topas is remotely represented in the ancestry of Roland I, Berggeist, and Bergglück. Jos. Rigault and Pfückmaus are the parents of the well-known Juli variety, and the former is also one of the progenitors of Goldapfel. Graf Dohna springs from the cross Agraria × Sophie and Roode Star from Wohltmann × Erika. The fact that Lech and Topas, like Jubel, are bearers of resistance to scab as well as immunity from wart disease is considered to point to a connexion between these characters.

DOWSON (W. J.). **Fork stab rot of early Potatoes.**—*Tasmanian Journ. of Agric.*, N.S., ii, 1, pp. 26–29, 1931.

In Tasmania much loss has recently been sustained in consignments of early, immature export potatoes (Bismarcks) during the hot season of January to March, by a soft black rot due to infection of the tubers by *Pythium de Baryanum* following mechanical injury. The affected tubers collapse completely during transit and

are reduced to a watery, evil-smelling mass. Much more careful handling of the potatoes, and improved sanitary precautions on the farms, especially the avoidance of the common practice of throwing rotted tubers back on the soil, are urgently recommended.

MÜLLER (K. O.). **Ueber die Entwicklung von Phytophthora infestans auf anfälligen und widerstandsfähigen Kartoffelsorten. Untersuchungen über die Kartoffelkrautfäule und die Biologie des Erregers. II.** [On the development of *Phytophthora infestans* on susceptible and resistant Potato varieties. Investigations of the Potato blight and the biology of the causal organism. II.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 4, pp. 465–505, 10 figs., 1 diag., 2 graphs, 1931.

Continuing his investigations on the biology of *Phytophthora infestans* in relation to the development of late blight of potatoes [*R.A.M.*, x, p. 53], the author found that environmental conditions, e.g., temperature, atmospheric humidity, and precipitation, exert a pronounced effect on the reproductive capacity of the fungus and consequently on the time of appearance and intensity of the disease. The fact that in Central Europe infection is scarcely ever extensive before the end of June is explained by the relatively low mean temperatures prevailing before this time which prevent the rapid liberation and spread of the zoospores from the overwintered oospores. An important part in the development of infection is further played by varietal idiosyncrasies in respect of the date of maturation. Susceptibility to infection increases with advancing age, and hence the early maturing varieties are attacked before the late ones. This relationship holds good for the resistant wild (W) strains [loc. cit.], but they reach the susceptible stage much later than the cultivated varieties and consequently the reduction of the yield in them is negligible.

It has been found that apparently sudden outbreaks of late blight are preceded by a period during which the inoculum accumulates. Hence the intensity and extent of an epidemic are conditioned rather by the weather conditions beforehand than by those prevailing while the disease is actually in progress [ibid., v, p. 628 *et passim*]. The spread of the fungus, however, is governed by the reaction of the host as well as by meteorological conditions. Even in the field the W strains would probably maintain their resistance to *P. infestans* during the first half of the vegetation period. In the writer's comparative tests, the W strains were grown in close proximity to the susceptible Feodora, Alma, and Vesta varieties, the latter being attacked long before the former showed the first leaf spots. It is reasonable to suppose that the primary infection on the W strains originated predominantly on the cultivated varieties. The larger the proportion of W strains, the lower the rate of development of the parasite and the slighter the reduction in yield due to the disease. Confirmation of this view was obtained from two potato breeders who grew the W strains at a distance from any cultivated varieties; no late blight infection was observed notwithstanding highly favourable weather

conditions. In order to secure complete resistance to *P. infestans* in practice, therefore, it would be necessary to plant extensive areas with varieties corresponding to the W strains in their reaction to the fungus.

The migrations of the potato from its introduction into Europe during the latter part of the sixteenth century down to the present day are briefly traced. The available evidence points to the fact that the varieties now under cultivation in Europe are descended from only a few primitive forms. The Russian scientist Rybin and his collaborators have reached the conclusion (*Zeitschr. für Induktive Abstammungs- und Vererbungslehre*, liii, p. 311, 1930) that the cultivated potato is of polyphyletic origin. In South America there are cultivated varieties with 24, 36, and 48 chromosomes. Among the latter group (to which the European varieties belong) there are stated to be 'no less than seven distinct geographically localized types, corresponding to Mexico, Central America, Central Colombia, Central Peru, South Peru, Bolivia, and South Chile'. It has further been found that the various forms of the collective 'species' *Solanum tuberosum*, differ from each other and from certain wild, tuber-forming species of *Solanum* regarded by systematists as independent species, in more sharply marked and important characters than the latter among themselves.

All these data support the theory that only a small part of the forms constituting the collective species *S. tuberosum* has as yet reached Europe. A closer examination of the entire *tuberosum* group, including the cultivated varieties of the country of origin, would in all probability reveal valuable qualities that are missing in European cultivated forms.

SCHLUMBERGER (O.). **Die Bewertung der Rhizoctonia-Erkrankungen bei der Pflanzkartoffel-Anerkennung.** [The estimation of *Rhizoctonia* diseases in the certification of seed Potatoes.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, vii, 8, pp. 237–239, 1931.

The certification of seed potatoes should not, in the writer's opinion, be refused on account of slight or even moderate pitting by the sclerotia of *Rhizoctonia* [*Corticium solani*: *R.A.M.*, x, p. 201]. Only where the bulk of the tubers are heavily infected is rejection on these grounds justified. It is pointed out that the use of apparently healthy tubers does not prevent the occurrence of the disease in the progeny, and further, that the unnoticed presence of hyphae on the tubers may be quite as injurious as that of sclerotia. Certification should not necessarily be refused on account of *Rhizoctonia* foot rot, as this is not always followed by tuber infection.

MILES (H. W.). **Field studies on Heterodera schachtii Schmidt in relation to the pathological condition known as 'Potato sickness'.**—*Journ. of Helminthology*, viii, 2, pp. 103–122, 4 pl., 1930. [Received June, 1931.]

The study of the life-history of the eelworm *Heterodera schachtii* under English conditions, together with field observations from

1927 to 1929, inclusive, of cases of the so-called 'potato sickness' of the soil [*R.A.M.*, ix, p. 335; x, p. 203], lead the author to consider that under normal conditions the eelworm in itself is very slightly, if at all, injurious to the potato, while being invariably present in every case studied. On the other hand, *Corticium solani,* which was also constantly present, is capable of setting up a pathological condition in the host plant independently of the eelworm; the diseased condition, however, is usually temporary, and the plants gradually recover and produce a normal crop of tubers, even when considerable numbers of *H. schachtii* are present in the root tissues. Occasionally *Colletotrichum tabificum* [*C. atramentarium*] was also found in 'potato sick' soil, but no great importance is attached to this fungus.

The investigation showed further that under field conditions normal crops can be occasionally obtained on 'potato sick' soil, in which the potato crop failed the previous season, this suggesting the occurrence of other factors which at the outset appear to lower the resistance of the potato plant and result in the formation of typical 'potato sick' areas. Experiments on soil treatment showed that in such areas the growth of the potato plant can be stimulated by the use of naphthalene or calcium cyanide, but the results produced are not always such as to warrant the use of costly materials. On the other hand, the yield of potatoes on 'potato sick' soil was greatly increased in 1929 by the application of extra nitrogen in the form of a top-dressing of calcium cyanamide, the results suggesting that the use of this chemical as a stimulant for potatoes is worthy of consideration in some areas in the north-west of England.

ITO (S.) & SHIMADA (S.). **On the nature of the growth promoting substance excreted by the 'bakanae' fungus.**—*Ann. Phytopath. Soc. Japan,* ii, 4, pp. 322–338, 1 pl., 1931. [Japanese summary.]

A tabulated account is given of the writers' experiments to determine the nature of the stimulatory substance of the 'bakanae' fungus (*Fusarium* sp.) [*Lisea fujikuroi*] which causes the excessive development of rice seedlings in Japan [*R.A.M.*, ix, p. 54].

The optimum concentration of the fungus filtrate (on Richards's solution diluted with Knop's solution) for the development of the 'bakanae' symptoms was found to be between 1 and 10 per cent. No comparable action on rice seedlings was exerted by the filtrate of a culture of *F. lini.* The growth-promoting substance is thermostable, neither enzymic nor volatile. It is completely absorbed by animal black, and is diffusible through semi-permeable membranes. The omission of either or both KH_2PO_4 or $MgSO_4$ from the culture solution altogether prevented the development of the 'bakanae' phenomenon and even arrested the normal growth of the seedlings.

BEELEY (F.). **Distribution of Oidium heveae disease of Rubber in Malacca and southern Negri Sembilan, November, 1930.** —*Malayan Agric. Journ.*, xix, 2, pp. 91–93, 1 map, 1931.

In the course of a tour of inspection made to determine the

distribution of mildew of *Hevea* rubber (*Oidium heveae*) in Malacca and southern Negri Sembilan, Malaya, during November, 1930, it was observed that in areas attacked earlier in the year [cf. *R.A.M.*, ix, p. 803] trees not yet 3 years old no longer showed the presence of the fungus, even the mature leaves showing no sign of attack. Trees over 15 years old showed the heaviest infection, with very poor recovery from the attack of the previous April, the young leaves being severely mildewed.

Preventive spraying tests are to be conducted over a considerable area.

GANDRUP (J.). **Beschouwingen over meeldauw.** [Observations on mildew.]—*De Bergcultures*, v, 10, pp. 262–268, 5 diags., 1931.

The writer discusses the results of a series of experiments, conducted in East Java from 1927 to 1929, to ascertain (*a*) whether a definite date, approximately the same every year, could be fixed for the outbreak of rubber mildew [*Oidium heveae*: see above, p. 486]; and (*b*) if trees remaining free from the disease in one season exhibit a similar immunity in following years. The investigations were carried out by identical methods on five different estates, the observations being made at three-weekly intervals on successive batches of trees at the time of normal leaf fall and the subsequent development of new foliage.

The first fact observed in 1927 was the virtual absence of mildew among trees shedding their leaves early (April and May); those reaching this stage at the end of June showed rather more infection, while all but one of those in a similar condition on 25th August were severely diseased. No infection was observed on trees losing their foliage late in the season (from the second half of September onwards), suggesting either a decrease of virulence in the fungus or an accession of resistance in the host at this season. Similar data were obtained in 1928. Infection was much more severe in 1929, when the critical period started earlier (beginning of August). One tree that shed its leaves in May, but did not develop fresh foliage until early August, became infected, indicating that the time of mildew attacks is determined by the new leafage.

A comparison of the data obtained from one estate shows that the severity of mildew varies from year to year. In 1927 there was no defoliation from the disease in July and August, whereas in 1929 this symptom was observed at the beginning of August and persisted for a lengthy period. In 1928 the disease occurred in a mild form, heavy defoliation taking place only during the latter part of August. On another estate the conditions were entirely reversed, indicating that no generalizations can be made as regards the correct time to apply control measures. Thus, on estate A, there would have been no need to start dusting in 1929 before the latter half of July. In 1928 the disease was so mild that treatment could safely have been omitted; if given, however, it should have been commenced during the first half of July. In 1927 the dusting should have started in July and proceeded until November.

Regarding the behaviour of the same trees in different seasons, the following observations were made. One tree that shed its leaves naturally at the end of August, 1927, and then contracted mildew with defoliation, was only slightly attacked in 1928 when normal leaf fall occurred at the end of May; in 1929, when the leaves were shed still earlier, the disease was very mild. Similar data were obtained in a number of other cases. The probabilities are that there are individuals that shed their leaves at the same time every year and so display a uniform reaction towards the mildew.

PFÄLTZER (A.). **Proeven en waarnemingen in verband met de meeldauwbestrijding bij Hevea brasiliensis gedurende 1930.** [Experiments and observations in connexion with mildew control in *Hevea brasiliensis* during 1930.]—*Arch. voor Rubbercult. Nederl.-Indië*, xv, 3, pp. 147–170, 2 plans, 5 graphs, 1931. [English summary.]

Full details are given of the continued experiments in the control of *Hevea* rubber mildew (*Oidium*) [*heveae*] by sulphur dusting on the Pondok Gedeh plantation, Java, during 1930 [*R.A.M.*, ix, p. 336].

Wintering and mildew infection assumed an entirely different form in 1930 from that of previous seasons, the former starting later but finishing earlier than usual owing to the simultaneous formation of young leaves by a large number of trees. Owing to the more rapid course of wintering the mildew attacks were less severe than usual. The application of preventive treatments before the disease made itself clearly evident failed to reduce the incidence of mildew to any appreciable extent. On account of unsuitable weather conditions and the irregularity of wintering in the different plantations, no definite conclusion could be reached as to the best quantity of sulphur to be used at each application. No important difference was observed between the efficacy of the local Kawah Poetih sulphur and that of the American 'sulphur smoke' brand of sulphur.

It was found that, where dusting was discontinued during the critical period, severe attacks of *O. heveae*, accompanied by defoliation, recurred after 19 days. It is concluded, therefore, that the interval between the applications should not exceed 14 days. The date of the first application should be made dependent on the number of infections on the young shoots rather than on the wintering process.

BEELEY (F.). **Control of mouldy rot disease of Rubber.**—*Malayan Agric. Journ.*, xix, 2, pp. 74–76, 1931.

In making recommendations for the control of mouldy rot of the tapped bark of *Hevea* rubber (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*: *R.A.M.*, v, pp. 184, 692; ix, p. 405] under Malayan conditions, the author points out that as the fungus grows best at 22° to 26° C. and is killed at 35°, all the necessary sanitary precautions [which are indicated] must be taken to ensure a dry, sunny atmosphere within the holding.

The parts of the tree requiring disinfection should be thoroughly cleaned and any overflow residue of rubber removed; to reach the interstices of the bark where the spores may be washed by rain once the disease has become established, the use of a fine spray is essential in addition to painting the renewing bark with disinfectant.

Infected trees should be excluded from tapping for one month, but should tapping be essential for commercial reasons, the freshly cut portions of the panels must be painted with disinfectant after each tapping.

Three applications on succeeding days of the following water-miscible disinfectants are recommended for trees already attacked, viz., 3 per cent. izal, 5 per cent. brunolinum plantarium, or 5 to 10 per cent. agrisol. The insoluble cargillineum B mixture (paste), applied at weekly intervals has also given good results. If tapping is to be continued, the freshly cut bark must be painted with the last-named daily for one month. In wet weather, or as an additional precaution, the water-miscible disinfectants may be followed by a coating of waterproof disinfectant such as 10 per cent. brunolinum with 90 per cent. tar or with 50 per cent. asphaltum and 40 per cent. kerosene, 10 per cent. solignum with 90 per cent. tar, or 10 per cent. cargillineum mixture B. Any of these four mixtures may be substituted for the third application of the water-miscible disinfectant, and should be applied only when the surface of the panel is dry.

JENSEN (H. L.). **The fungus flora of the soil.**—*Soil Sci.*, xxxi, 2, pp. 123–158, 1931.

A summarized account is given of the author's study of the mycoflora of 100 different Danish soils of widely varying character (with particular reference to cultivated soils), as well as of the distribution of the fungi in relation to soil conditions and of their importance in certain biochemical soil processes. The largest amount of mycelium was found in acid soils rich in organic matter, while plate counts showed numbers of fungi ranging from 24·3 to 460 thousand per gram of soil. Direct isolations yielded mainly species of *Trichoderma* from forest, moor, and heath soils, and chiefly species of Mucoraceae from field, garden, and salt marsh soils. The most common genera were *Mucor*, *Zygorrhynchus*, *Absidia*, *Penicillium*, *Trichoderma*, *Fusarium*, and a sterile form resembling *Cunninghamella elegans*, besides a number of other species of less constant occurrence, among which species of *Aspergillus* were found only sporadically in ordinary soils but very abundantly in those in hot-houses, and species of *Fusarium* and *Phoma* were characteristic of cultivated soils.

No clear relationship was determined between the number of fungi and the reaction or type of soil, except that very heavy clay soils were poor in fungi; the addition of lime to acid soils did not markedly depress the number of fungi, but greatly stimulated the development of bacteria and actinomycetes. Fertilization, especially with farmyard manure, appeared to increase the number of all three groups of organisms. In general, the investigation indicated that the actual abundance of fungi in the soil depends on many factors, among which food supply plays an important part. The

addition of dextrose considerably stimulated the fungi in acid soils, but little or not at all in neutral or alkaline soils. Most of the fungi studied, with the exception of the Mucoraceae, were capable of decomposing cellulose, the addition of which stimulated an abundant development of fungi in both acid and alkaline soils. The addition of casein gave rise to an abundant development of fungi in acid but not in alkaline soil, except when cellulose was added to the latter. Lucerne seed meal promoted an abundant growth of species of *Penicillium* and of Mucoraceae in acid soil, and a somewhat more limited growth of Mucoraceae and species of *Fusarium* in neutral and alkaline soils.

The proteolytic capacity of the soil fungi varied considerably with the experimental conditions, and the most strongly proteolytic fungi were not necessarily those whose growth was most stimulated by the addition of protein to the soil.

JENSEN (H. L.). **The microbiology of farmyard manure decomposition in soil. I. Changes in the microflora, and their relation to nitrification.**—*Journ. Agric. Sci.*, xxi, 1, pp. 38–80, 13 graphs, 1931.

This is a detailed account of laboratory experiments (which form part of an investigation of the causes underlying the incomplete utilization in soil of the available nitrogen of farmyard manure) in which various kinds of farmyard manure were allowed to decompose in soils of different character, and the development in these soils of bacteria, actinomycetes, and fungi was compared with the formation of nitrate and the disappearance of carbon. In a neutral, heavy clay soil, the fungi were not affected by the addition of manure, but the further addition of fresh straw caused a very great increase in their numbers, probably due to vegetative growth and not merely to sporulation, since the increase was only temporary. The increase was almost entirely due to a species of *Cephalosporium* which probably utilized the sugars and pentosans of the straw, since it did not grow on filter-paper cellulose in pure culture. In an acid soil of similar physical constitution, the fungi were only slightly stimulated by the addition of manure alone, but when fresh straw was also added their numbers at once rose to enormous counts and remained constant for a very long period. The dominant forms were a species of *Trichoderma* (? *koningi*), which is an active cellulose decomposing organism, a species of *Zygorrhynchus* (? *vuillemini*) [*R.A.M.*, vii, p. 740], and a yellow fungus, probably a species of *Amblyosporium*. Tests by McLennan's method [ibid., vii, p. 471] for distinguishing between spores and mycelium in the soil, showed that the fungus colonies on the plates apparently originated from spores as well as from vegetative mycelium; the species of *Trichoderma* and *Zygorrhynchus*, however, appeared to be present mainly as mycelium, since they were most strongly affected by drying. The higher counts indicated, therefore, that besides spore formation, an active growth of fungi had occurred, resulting in the formation of considerable amounts of mycelium which was still living after 400 days.

In a light sandy soil, rather poor in organic matter and of P_H 6, the fungi were not affected by the addition of manure or ammonium

sulphate, except that their numbers appeared to drop markedly in the limed soil plus ammonium sulphate. The addition of straw caused them to multiply vigorously in the unlimed soil. The increase in fungi was mostly due to a single species, probably a *Monosporium*, which grew vigorously on filter paper cellulose in mineral solution. As regards the general purpose of the investigation, the results showed that the nitrification of the nitrogen in manure became active at the period when the numbers of all three groups of organisms were decreasing after the initial increase. The C : N ratio of the manure exerted a great influence upon the degree and the rapidity of the nitrification. In some instances there was a significant loss of total N in the soils, which may have been due to denitrification.

JENSEN (H. L.). **The microbiology of farmyard manure decomposition in soil. II. Decomposition of cellulose.**—*Journ. Agric. Sci.*, xxi, 1, pp. 81–100, 1931.

In continuation of his studies of the phenomena accompanying the decomposition of farmyard manure in soil [see preceding abstract] the author gives details of experiments to determine the types of cellulose-decomposing organisms which are active, and the amounts of nitrogen assimilated by them in proportion to the cellulose decomposed. The results indicated that among the fungi isolated, species of *Trichoderma* and *Penicillium* appear to be more active in acid soils, while other forms, e.g., *Mycogone nigra*, *Stachybotrys* sp., ? *Coccospora agricola*, and *Botryosporium*, seemed prominent in neutral soil. It was also established that both fungi and bacteria are capable of decomposing the lignified cellulose of straw, and that the nitrogen requirements of the cellulose-decomposing bacteria are not smaller than those of the fungi. The bacteria do not form humus-like compounds when growing on filter paper in sand culture, but at least two of the fungi, namely, *M. nigra* and *Stachybotrys* sp., formed such compounds in sand and sterile soil.

MENCHIKOVSKY (F.). **The soil and hydrological conditions of the Jordan Valley as causes of plant diseases.**—Reprinted from *Hadar*, iv, 2, 19 pp., 2 figs., 2 maps, 1931.

The results [which are tabulated and discussed] of a chemical analysis of the soils of the Kinnereth district, in the Jordan Valley near the Sea of Galilee, showed the existence of a connexion between certain non-parasitic diseases of bananas, vines, eucalyptus, and eggplants in this region and the high percentage of common salt and sodium bicarbonate in the soil, coupled with the excessive humidity of the latter due to over-irrigation and rain water.

Accumulations of common salt were found to be responsible for the death of the bananas and eucalyptus in the low-lying areas inspected. In the soil in which the latter plant was growing the quantity of common salt was 0·7 per cent. chlorine (1·16 per cent. NaCl) in the upper strata and 0·39 per cent. chlorine (0·64 per cent. NaCl) in the lower. Where eucalyptus trees died out the ground became covered with *Tamarix* bushes.

In other areas vines were killed by accumulations of sodium bicarbonate. At one place in which they were destroyed the quantity of sodium bicarbonate was found to be about 0·15 per cent., or some four times the maximum quantity that the plant can tolerate without ill effects. Where eggplants were affected, however, the amount of sodium bicarbonate was only about 0·1 per cent. In the section where this crop suffered most severely the eggplants only develop satisfactorily in years of drought, the yield and general condition of the plantation deteriorating under excessively humid conditions and in low-lying sites. In this case, therefore, superfluous soil moisture, rather than the small quantity of sodium bicarbonate, appears to be the primary cause of the disturbance.

MUSZYNSKI (J.). **Masowe wystąpienie rdzy Kozłkowej Puccinia commutata Sydow na hodowanej Valeriana officinalis L.** [Epidemic outbreak of Valerian rust *Puccinia commutata* Sydow on the cultivated *Valeriana officinalis* L.]—*Acta Soc. Bot. Poloniae*, vii, 2, pp. 89–92, 3 figs., 1930. [German summary. Received April, 1931.]

This is a brief account of an epidemic outbreak in 1929 of rust (*Puccinia commutata*) which involved practically every plant in a 2,300 sq. m. plot of *Valeriana officinalis* at the University of Vilna, Poland, causing severe defoliation. The irregular, dark yellow, frequently coalescing aecidiosori appeared on the under side of the leaves; the aecidiospores were mostly rounded, yellow, thin-walled, and usually from 15 to 22 μ in diameter. The petioles of the diseased leaves bore the brownish teleutosori of the fungus, containing slightly constricted, smooth-walled (not warty as in *P. valerianae*) teleutospores, 45 to 55 by 20 to 36 μ in diameter. No uredo stage was observed.

The outbreak of *P. commutata* was quite unexpected, since it had not been previously recorded in the locality, where valerian had been grown for a few years from seed of local production. The rust was easily controlled by spraying the plants with a 2 per cent. carbonate of soda solution; not only was the new foliage free from the rust, but the spray appeared to kill the pustules already formed.

NANNIZZI (A.). **Materiali per una flora micologica del Senese.** [Materials for a mycological flora of the Siena district.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, v, 6, pp. 384–389, 1931.

Among these fifty new records of fungi mostly collected in and around Siena, Italy, during 1929 and 1930, the following are of interest in addition to some already noticed from another source [*R.A.M.*, x, p. 129]. *Ustilago avenae* var. *levis* [*U. kolleri*] was found on oats, *Dendrophoma pleurospora* f. *vitigena* on vine leaves, *Macrophoma taxi* on leaves of *Taxus baccata*, *Stagonospora fragariae* on strawberry leaves, *Septoria leucanthemi* [ibid., vi, p. 557] on the leaves of *Chrysanthemum leucanthemum*, and *Gloeosporium coryli* on those of *Corylus avellana*.

DA CAMARA (E. de S.). **Mycetes aliquot novi aliique in mycoflora Lusitaniae ignoti. III.** [Some new fungi and others unknown in the mycoflora of Portugal. III.]—Reprinted from *Ann. Inst. Sup. Agron.*, iv, 9 pp., 18 figs., 1931.

Amongst the fungi recorded or described in this paper the following may be mentioned. *Phoma psidii* n. sp., found on the branches of *Psidium guajava* in the Colonial Garden, Lisbon, in February, 1931, is characterized by scattered black, globose-depressed, papillate pycnidia, 180 to 300 μ in diameter; simple, continuous, cylindrico-conical, hyaline conidiophores, 12 to 20 by 2 μ; and ellipsoidal or subclaviform, usually straight, biguttulate, sometimes trinucleate, continuous, hyaline conidia, often tapering towards the base, 7 to 10 by 2·5 to 3·5 μ.

Phyllosticta adusta was found in November, 1929, on living leaves of *Citrus medica* in the garden of the Lisbon Agricultural Institute.

Zythia psidii n. sp., found in association with *Phoma psidii* on the branches of *Psidium guajava*, has scattered or occasionally clustered, somewhat papillate, subglobose or ellipsoidal, ferrugineous pycnidia, 148 to 250 μ in diameter; and extremely numerous conidia, expelled in a brown cirrus from the pycnidia, generally cylindrical, oblong, or ovoid, very pale yellow, rounded at both ends, some binucleate, others eguttulate, very slender, 2 to 5·5 by 2 μ.

Colletotrichum ipomoeae n. sp., observed on sweet potato stems in the Colonial Garden, Lisbon, in December, 1929, is characterized by basket-shaped, projecting, fuligineous acervuli, up to 270 μ in diameter; numerous straight or curved, sparsely septate, subhyaline or brown setae, 70 to 125 by 5 to 7 μ; and cylindrical, straight or slightly curved, hyaline conidia, rounded at both ends and 16 to 25 by 3·5 to 5 μ in diameter.

Septogloeum pomi was found in September, 1930, on apple fruits near Colares (Cinthia).

Oidium caricae [*R.A.M.*, vi, p. 42] was found on the leaves of *Carica papaya* in the Colonial Garden, Lisbon, in September, 1930.

Microcera coccophila [ibid., viii, p. 172] was found in February, 1930, parasitizing *Ceroplastes rusci* in association with *Fusarium larvarum*. The conidia are exceptionally large (up to 138 by 7 μ).

NANNFELDT (J. A.). **Contributions to the mycoflora of Sweden.**—*Svensk Bot. Tidskr.*, xxv, 1, pp. 1–31, 5 figs., 1931.

The author accepts v. Höhnel's genus *Drepanopeziza* for the Discomycetes found on *Salix* sp. previously named *Excipula sphaeroides* Fries and *Trochila salicis* Tulasne. The former has *Marssonina salicicola* Bres. [*R.A.M.*, ix, p. 814] as its conidial stage, and the latter *Gloeosporium salicis* West. [ibid., viii, p. 289] for which the name *Gloeosporidiella salicis* n. comb. is preferred. A discussion is given of the conidial forms referred by different authors to *Gloeosporium*, and the division of the genus into several, proposed by various workers, is approved [cf. ibid., vii, p. 274].

Other related fungi found on *Salix* spp. include *Pyrenopeziza fuckelii* in Sweden and Finland; *Naevia vleugelii* (Rehm) Nannf.

n. comb. (=*Pseudopeziza vleugelii*, *P. versicolor*, and *Pyrenopeziza sphaeroides*) in Sweden; *M. dispersa* n. sp. (=*M. obscura* Lind non Romell), characterized by hyaline, broadly ellipsoid to cuneate or piriform, curved macroconidia, septate below the middle, 18 to 22 by 6 to 9 μ, producing small, purplish-black spots on both surfaces of living leaves of *S. aurita* and *S. cinerea* in Sweden, Norway, Denmark, and Finland; and *M. salicigena* (Bub. & Vleug.) Nannf. n. comb., emend. (=*G. salicigenum* and *M. didyma*) in Sweden and Finland.

In an appendix is given an alphabetical list of all the species of *Gloeosporium* and *Marssonina* (*sensu* Saccardo) growing on willows, with notes on some of them. The bibliography comprises 64 titles.

SAWADA (K.). **Descriptive catalogue of the Formosan fungi. Part V.**—*Rept. Dept. Agric. Res. Inst. Formosa*, 51, 152 pp., 5 pl., 1931.

This paper comprises 128 additions to the author's catalogue of Formosan fungi [*R.A.M.*, viii, p. 199]. The descriptions are in Japanese, but the names of the fungi and hosts, some of the literature references, and the indexes are in roman script. Some 26 of the fungi are described as new species and most of the more interesting forms are figured.

SIDERIS (C. P.). **Pathological and histological studies on Pythiaceous root rots of various agricultural plants.**—*Phytopath. Zeitschr.*, iii, 2, pp. 137–161, 11 pl., 1931.

The results of experiments carried out at the University of Hawaii to test the pathogenicity of various [listed] species of *Nematosporangium*, *Pythium*, and *Phytophthora* and of *Pseudopythium phytophthoron*, isolated from pineapples [*R.A.M.*, x, p. 325], on Lahaina and H. 109 sugar-cane, maize, banana (*Musa sapientum*), sweet potato, *Pennisetum barbinodum*, *Cajanus indicus* (New Era), *Vicia faba*, *Canavalia ensiformis*, *Vigna sinensis*, *Phaseolus aureus*, wheat, onion, potato, and sunflower (*Helianthus annuus*) are discussed and presented in tabular form.

The fungi [taxonomic studies on which are in course of publication elsewhere] were found to vary in their virulence towards the different hosts. As a group, the species of *Nematosporangium* were found to be more injurious to the roots of monocotyledonous plants than to those of dicotyledonous, whereas with *Pythium* the reverse was the case. *Phytophthora meadii*, *P. melongenae*, and *P. manoana* (a species to be described elsewhere by the author), as well as *Pseudopythium phytophthoron*, were highly pathogenic to onion roots, which are practically immune from the other organisms tested. Wheat proved highly susceptible to all the nine species of *Nematosporangium* used and may therefore be recommended as a fairly reliable test plant.

The writer favours the view that the initial development of parasitism is conditioned by chemical stimuli in the host tissues rather than by mechanical pressure on the part of the pathogen.

TOGASHI (K.), SIBASAKI (Y.), & SUGANO (Y.). **Morphological studies of white rust fungi in the cruciferous plants.**—*Agric. & Hort.*, v, pp. 859–882, 2 figs., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 3, pp. (82)–(83), 1931.]

Albugo candida [*Cystopus candidus*] is stated to occur on 118 species belonging to 42 genera of the Cruciferae [*R.A.M.*, ix, p. 573]; only the subfamilies Sinapeae and Hesperideae are affected. The authors' biometrical studies indicate that the variations in conidial dimensions are in some way related to the phylogeny of the hosts, those produced on *Brassica* and *Raphanus* (Sinapeae-Brassicinae) always being far larger than those developing on *Capsella* and *Arabis* (Hesperideae-Capsellineae and Hesperideae-Turritineae, respectively). Furthermore, the conidia on the two latter genera are almost spherical (length: breadth = 1·07), while those on the former are more elongated (length : breadth = 1·10). On the basis of these data two varieties of *C. candidus* are differentiated, viz., *macrospora* on *Brassica* and *Raphanus*, and *microspora* on *Arabis* and *Capsella*.

JACKSON (H. S.). **Present evolutionary tendencies and the origin of life cycles in the Uredinales.**—*Mem. Torrey Bot. Club*, xviii, pp. 1–108, 1 diag., 1931.

The following is a summary of the hypotheses discussed at some length in this paper concerning the present evolutionary tendencies and origin of life-cycles in the plant rusts [cf. *R.A.M.*, ix, p. 344]. The ancestral rusts, like the older species in existence to-day, were heteroecious, heterothallic, and pleomorphic. The autoecious long-cycled rusts have developed from heteroecious species, generally without the loss of heterothallism, in two distinct ways, the majority probably by a transfer of the full life-cycle to the aecidial host of the parent heter-eu-form, while others have arisen by a similar transfer to the host of the diploid phase. The brachy-forms have all been derived from autoecious species, as have also some of the -opsis and micro- forms, the bulk of which, together with most of the endo-forms, originated from the haploid phase of heteroecious rusts. In many cases the reduction in the life-cycle has been accompanied by the development of homothallism. The present general trend of development would appear to be towards the micro- and endo-forms.

A five-page bibliography is appended.

THURSTON (H. W., Jr.) & KERN (F. D.). **Notes on some rust collections from Colorado, Wyoming, and South Dakota.**—*Mycologia*, xxiii, 1, pp. 77–82, 1931.

A list is given of collections of rusts made by various workers during 1929 in Colorado, Wyoming, and South Dakota. It comprises 97 collections representing 12 genera and 53 species of rusts; eleven host plants are recorded as new for North America, nine as new for Wyoming, seven as new for South Dakota, and one is given as new for Colorado. Six of the rust species are recorded from their respective localities for the first time.

BOEDIJN (K. B.) & STEINMANN (A.). **Les espèces des genres Helicobasidium et Septobasidium des Indes Néerlandaises.** [The species of the genera *Helicobasidium* and *Septobasidium* of the Dutch East Indies.]—*Bull. Jard. Bot. Buitenzorg*, Sér. III, xi, 2, pp. 165–219, 5 pl. (2 col.), 31 figs., 1931.

A comprehensive account is given of the authors' investigations of the following species of *Helicobasidium* and *Septobasidium* occurring on insects infesting tea and other plants in the Dutch East Indies [*R.A.M.*, ix, p. 562 and next abstract], the new species being furnished with Latin diagnoses in addition to copious taxonomic and morphological observations: *H. compactum* Boedijn, *S. bogoriense, S. curtisii* (Berk. & Desm.) Boedijn & Steinmann n. comb., *S. flavo-brunneum* Boedijn & Steinmann, *S. lichenicolum* (Berk. & Br.) Petch, *S. molliusculum* H. & P. Sydow, *S. neglectum* n. sp., *S. obscurum* n. sp., *S. pilosum* Boedijn & Steinmann, *S. proliferum* n. sp., *S. rhabarbarinum* (Mont.) Bres., *S. robustum* n. sp., *S. rubiginosum, S. stratiferum* n. sp., *S. tigrinum* Boedijn & Steinmann, *S. theae* n. sp., *S. tjibodense* n. sp., *S. triviale* n. sp., and *S. tuberculatum* Boedijn & Steinmann.

A three-page bibliography is appended.

BOEDIJN (K. B.) & STEINMANN (A.). **Over de roetdauwschimmels van de Thee.** [On the sooty moulds of Tea.]—*Arch. voor Theecult. Nederl.-Indië, 1931*, 1, pp. 25–57, 9 pl., 1 fig., 1931. [English summary.]

Notes are given on five true and two spurious sooty moulds investigated by the authors on tea in Java, the former group comprising *Capnodium theae* Boedijn, *Chaetothyrium javanicum* (Zimmermann) Boedijn, *Phycopsis treubii* (von Höhnel) Boedijn, *Antennularia* sp., and *Triposporium* sp. [see next abstract], and the latter *Septobasidium theae* Boedijn & Steinmann and *S. curtisii* (Berk. & Desm.) Boedijn & Steinmann [see preceding abstract].

S. theae forms an extensive dark blackish-brown coating (approximately equivalent to rouge-orangé No. 65 Klincksieck and Valette) of irregular shape and dimensions on the branches and stems. The hairy, intensely black coating produced by *S. curtisii* may extend for a length of 12 cm. or more along the branches.

Any special measures against the spurious sooty moulds are quite unnecessary and even inadvisable in Java, since they are entirely harmless to the tea bushes and further perform a useful function in the destruction of coccids. The true sooty moulds, on the other hand, hinder assimilation and impede the respiration of the leaves, while damage is also caused by the suction of the insects in the secretions of which the fungi develop. Various control measures are indicated. The bushes may be sprayed with an insecticide, e.g., paraffin-soap emulsion or carbolineum plantarium; a solution of soda, carbolineum, or lime-sulphur may be applied to the twigs; and attempts may also be made to prevent the visits of ants to the scale-insect colonies, some of which rapidly disappear in the absence of ants.

BOEDIJN (K. B.). **Notes on some sooty molds.**—*Bull. Jard. Bot. Buitenzorg*, Sér. III, xi, 2, pp. 220–231, 1 fig., 1931.

The writer's investigations on the morphology of the sooty moulds in Java [see preceding abstract] have clearly shown that these fungi can only be differentiated on the basis of their ascigerous stages, which always show well-marked distinguishing characters, whereas similar types of conidia are produced by entirely different species.

Capnodium theae Boedijn n. sp., occurring on the leaves of tea bushes, is characterized by bistre to black colonies, slightly hairy in the thicker parts, splitting away in flakes when dry. The hyaline to subhyaline, septate hyphae composing the subiculum gradually merge into chains of round to oval, brown cells, 4·5 to 6 μ in diameter (6 to 9·5 by 4·5 to 7 μ). These chains often form *Coniothecium* conidia, 31 to 54 μ in diameter. *Microxyphium* pycnidia occur on all parts of the subiculum; they are cylindraceous, simple or branched, sometimes prostrate and forming secondary pycnidia, 150 to 750 by 30 to 105 μ, the prostrate ones up to 1 mm. long, with beaks 7·5 to 19 μ in width. The elliptical, hyaline conidia measure 3·5 to 4 by 1·5 to 2 μ. *Triposporium* conidia are present. The globose to oval, subsessile or long-stalked, papillate perithecia measure 112 to 352 by 52 to 112 μ, including the stalk, which is 36 to 97 μ wide. The stalks are often furnished with short hairs. The broadly oval to elongated asci measure 37 to 68·5 by 17 to 23 μ and contain eight irregularly bi- to triseriate, greenish-brown to brown, elliptical ascospores, tapering towards the base, with four to six septa and slightly constricted one to four longitudinal walls, 19 to 26 by 7 to 9 μ. A condensed Latin diagnosis of this fungus is given.

Chaetothyrium javanicum (Zimmermann) Boedijn nov. comb., the synonyms of which are *Capnodium javanicum* Zimm., *Limacinia javanica* Sacc. & D. Sacc., *Limacinula javanica* (Zimm.) v. Höhnel, *Phaeosaccardinula samoensis* v. Höhnel, and probably *Phaeosaccardinula theae* Sydow & Butler, is characterized by a blackish-brown subiculum consisting of densely interwoven cell chains composed of elliptical cells, 7 to 24 by 3·5 to 9·5 μ, of a pale dirty brown colour. The perithecia are globose, papillate, black, rather soft, more or less depressed after drying, and 157 to 273 μ in diameter. The broadly clavate asci measure 84 to 98 by 29 to 33·5 μ and contain eight ascospores, hyaline to pale dirty yellow, elliptical, tapering towards the base, with 5 to 9 transverse walls, many cells with one or two longitudinal walls, often obliquely placed, 26 to 49 by 8·5 to 14 μ. The spore dimensions given by Zimmermann for *C. javanicum* are 40 to 50 by 10 to 16 μ, by v. Höhnel 28 to 36 by 9 to 14 and 24 to 44 by 8 to 16 μ, and by Sydow & Butler 25 to 33 by 9 to 11 μ. This species occurs on the leaves of an undetermined palm, of *Alpinia* sp., and of tea. The conidial and pycnidial forms described by the above-mentioned authors are considered to belong to other sooty moulds, with which *C. javanicum* is often intermingled. In the palm material, however, the latter occurred alone, and on the other hosts its characteristic mycelium can be distinguished from that of the

other fungi. The generic name *Chaetothyrium* is preferred to *Phaeosaccardinula* in agreement with Petrak.

Aithaloderma setosum (Zimmermann) Boedijn nov. comb. (*Antennaria setosa* Zimm., *Limacinia setosa* (Zimm.) Sacc. & D. Sacc., *Capnodium guajavae* Bernard, *L. guajavae* (Bernard) Sacc. & Trotter, *Aithaloderma longisetum* H. & P. Sydow, *Hypnocapnodium setosum* (Zimm.) Speg.) forms large, black, readily scaling films on the leaves of *Tetracera hebecarpa*, *Mussaenda frondosa*, an undetermined palm, and coffee. The mycelium consists of densely interwoven, olive-brown, septate hyphae, 3·5 to 6 μ in diameter. *Microxyphium* pycnidia are numerous, mostly single, blackish-brown, and of very variable shapes; the common type with long beaks measure 126 to 378 by 17 to 38 μ (the beaks being 7 to 14 μ wide) and the hair-shaped up to 504 μ by 4 to 12 μ. The conidia of all forms are unicellular, elliptical, hyaline, and measure 3 to 4 by 1·5 μ. *Triposporium* conidia are present. The black, globose to slightly conical perithecia measure 60 to 96 μ in diameter and are furnished with a small ostiolate papilla, surrounded by a ring of 1 to 9 nearly black, septate hairs, 60 to 96 μ long, 6 μ in diameter near the base, tapering to 2·5 μ towards the apex. The broadly elliptical asci measure 40 to 54·5 by 12·5 to 16·5 μ and contain eight long-elliptical, 3- to 4-septate, hyaline to pale olive ascospores, 16·5 to 23 by 3 to 5 μ.

Phycopsis treubii (v. Höhnel) Boedijn nov. comb. (*Atichia treubii* v. Höhnel) occurs (always with other sooty moulds) on the leaves of an undetermined palm and of tea, and is characterized by a subglobose thallus (never star-shaped as in *Atichia*), olive-brown when fresh, brittle and black when dry, 72 μ to 2 mm. long and 100 to 150 μ in height; the subhyaline tissue is composed of parallel, often connected cell chains, embedded in a hyaline mucus. The cells are globular to elliptical, only 4·5 μ in diameter near the base, gradually increasing towards the periphery up to a length of 14 μ. The cortex of the thallus is composed of globose cells, 4 to 8 μ in diameter, encrusted with numerous brown granules. The propagulae are large, globose, projecting cell masses arising from the outer layers of the thallus and giving it a protuberant appearance; they are built up of globose cells 3 to 8 μ in diameter, and reach a diameter of 16·5 to 25 μ. The few globose to oval asci occur in a single row near the periphery and measure 27·5 to 33·5 by 23 to 25 μ; they contain eight conglobate, broadly elliptical, hyaline, bicellular ascospores, 9·5 to 20 by 7 to 9·5 μ.

A two-page bibliography is appended.

MIYAJI (K.). **Note on the presence of Monilia in mother culture of Soy sauce.**—*Gifu Imper. Coll. of Agric.* (*Japan*) *Res. Bull.* 10, 5 pp., 1930. (German.) [Abs. in *Chem. Abstracts*, xxv, 9, p. 2238, 1931.]

Aspergillus oryzae has hitherto been believed to be the principal mould in the mother culture of soy sauce [*R.A.M.*, iv, p. 305], but the writer isolated *Monilia* groups from this source. The fungi produce enzymes such as cellulase, amylase, invertase, and tryptase. On sugar-containing media up to 2 or 3 per cent. EtOH is produced. In artificial media containing NH_4 salts and glucose, the

moulds yielded *d*-lactic acid and succinic acid. In $C_3H_5(OH)_3$, *l*-tyrosine, and leucine media, tyrosol, *p*-hydroxyphenyllactic acid, and leucinic acid were produced.

The Fruit Tree Pests (West Norfolk) Order of 1931.

By order of the Minister of Agriculture and Fisheries, under the Fruit Tree Pests (West Norfolk) Order of 1931, if it appears to the local authority that any fruit trees in the area concerned are affected with canker [*Nectria galligena*], brown rots [*Sclerotinia cinerea* and *S. fructigena*], or apple and pear scab [*Venturia inaequalis* and *V. pirina*], and that the disease is likely to spread, an officer shall examine the trees, and if they are found to be infected the occupier of the land shall be required within a prescribed time to treat the trees as directed. He may be required to cut out and burn any dead or diseased branch, and pick and burn any affected fruit.

The appointed officers are empowered to enter any premises and examine any fruit trees, and failure to comply with any notice served under this order or to afford reasonable facilities for inspection, or any attempted obstruction thereof is punishable by a fine not exceeding ten pounds for a first or fifty pounds for a subsequent occasion.

WAHL (B.). **Die pflanzenschutzliche Gesetzgebung in Österreich.** [Plant protection legislation in Austria.]—*Neuheiten auf dem Geb. des Pflanzensch., 1931*, 1, pp. 2–6, 1931.

The principal enactments relating to plant protection in Austria are enumerated, including the potato wart [*Synchytrium endobioticum*] regulations [*R.A.M.*, ix, p. 608], with brief explanatory notes.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iii, 2, pp. 69, 88, 1931.

GERMANY. As from 7th July, 1930, the importation into Germany of flower corms and bulbs is restricted to consignments accompanied by a duly authenticated certificate (in the German language) vouching for their freedom from *Pseudomonas hyacinthi* [see above, p. 524], *Sclerotinia bulborum* [*R.A.M.*, v, p. 14], *Sclerotium tuliparum, Botrytis tulipae* [see above, p. 524], and ring disease (*Penicillium* sp.).

BULGARIA. Under the provisions of an enactment dated 26th April, 1930, the Bulgarian Ministry of Agriculture is empowered to draw up regulations concerning various aspects of plant protection, e.g., the prohibition of importation of seeds, plants, &c., liable to introduce diseases and pests; the safeguards under which such material may be imported and the mode of disinfection to which it shall be subjected; the destruction of plants, trees, shrubs, vines, &c., infected by serious diseases; the prohibition of sale of diseased plant material; and the fulfilment of the legal plant protection requirements of the countries importing Bulgarian products.

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KUYPER (J.). **Verslag van het Deli Proefstation over het jaar 1930.** [Report of the Deli Experiment Station for the year 1930.]—*Meded. Deli Proefstat. te Medan- Sumatra*, Ser. II, 68, 64 pp., 1931.

This report contains the following references of interest in regard to tobacco diseases. Promising results were again obtained in the control of slime disease [*Bacterium solanacearum*] by steam sterilization of the soil [*R.A.M.*, ix, p. 614; x, p. 299]. An examination of two treated seed-beds in 1931 showed that the soil had remained free from infection for 14 and 12 months, respectively, when tested by growing successive lots of seedlings in the beds. Tests of eight crosses between Deli tobacco and various species of *Nicotiana* (other than *N. tabacum*) showed that only one was more resistant to slime disease than Deli tobacco, and this strain yielded no seed.

The Rotterdam B disease of tobacco appears to be spreading extensively, and was found for the first time on seedlings in 1930.

'Tjakar', a disease of tobacco resembling the American frenching [ibid., ix, p. 810], occurred in a severe form after many years' non-appearance. There is some reason to believe that the disturbance is due to soil conditions.

Referring to the excellent control of top rot of tobacco [ibid., x, p. 299] given by the application to the soil of a boric acid solution [ibid., ix, p. 616], the writer states that the standard amount of 3 mg. per l. of water is insufficient in very severe cases. That the disease is not entirely due to the absence of boron from the soil is shown by the fact that it did not occur in a number of pot cultures in soil from severely affected fields, to which boron was not added. Burnt hearts, probably a form of top rot [ibid., ix, p. 614], occurred on seedlings from a number of localities.

The damage inflicted by leaf spot (*Cercospora*) [*nicotianae*: ibid., ix, p. 140 *et passim*] on tobacco plants from 20 to 30 days old and upwards is believed to have been heavier than at any time within the last twelve years. The disease began on a section of black volcanic soil during a very rainy spell in March and continued to spread in the dry weather following in April, eventually reaching the lower plantations on alluvial ground, where infection, however, was less severe.

BÖNING (K.). **Zur Ätiologie der Streifen- und Kräuselkrankheit des Tabaks.** [On the etiology of the stripe and curl disease of Tobacco.]—*Zeitschr. für Parasitenkunde*, iii, 2, pp. 103–141, 24 figs., 1931.

A comprehensive account is given of the writer's investigations and experiments in Bavaria on the etiology of the stripe and curl disease of tobacco [*R.A.M.*, viii, p. 548], the external and internal symptoms of which are fully described.

On the stems and veins the injuries consist of elongated, not always continuous, brown to slate-grey stripes of diseased and sunken tissue. On the stems several stripes, 0·5 to 1 cm. in width, may run parallel to each other. On the main veins, the stripes are narrower but otherwise similar to those on the stems. The death and collapse of the veins while growth is still proceeding results in a check to their growth relative to that of the intervening tissue, so that the latter bulges and the leaves present a curly or crumpled appearance with very sinuate margins, and are partially or wholly deformed. The leaf tissue may die along the veins and polyhedric or circular necroses appear also in the intercostal areas, merging later into continuous irregular lesions which kill the whole leaf. In other cases the outline of the leaf may be preserved while the necrotic areas break away. The necroses are first indicated by a pale mosaic colour, subsequently turning yellow and ultimately brown. In the centre, the dead tissue becomes quite desiccated and bleached, so that the affected leaves are sprinkled with small, white spots in the midst of larger brown areas. The edges of affected leaves turn downwards. The pedicels may be severely attacked and the flowers fall, while the sepals, anthers, and seed capsules are also liable to infection.

The first symptom induced by artificial inoculation with the sap of diseased plants is a mottling of the upper portions of the plant, followed by necrosis of the young leaves and of the stem. When the upper part of the stem remains alive, new leaves are formed which show more or less necrosis or malformation. When the vein of a fully grown leaf is inoculated, the stem and younger shoots are seldom affected. In seedlings the first symptom of infection is a slight wilting and mottling of the younger leaves, frequently followed by the death of the upper part of the plant, and in severe cases by that of the stem and lower leaves. The plants may, however, recover completely and produce flowers and seed. These variations in the severity of infection according to external or internal factors are analogous to those observed in certain other diseases of tobacco, e g., the virus diseases Rotterdam B and ring spot [ibid., ix, p. 614; x, p. 60, *et passim*].

The pith of infected stems is discoloured and shrivelled and cavities are formed in the dead tissue, a feature described by Fawcett in connexion with the Corcova disease of tobacco [ibid., i, p. 318] and also characteristic of Rotterdam B disease. Microscopic examination shows that the most severe damage occurs in the cells of the pith and cortical parenchyma, which are traversed in a tangential direction by necrotic zones. The decay spreads to the secondary cortex and xylem. No fungi or bacteria could be detected in the areas with internal necroses, but once the latter

penetrate to the epidermis they afford a favourable starting-point for *Sclerotinia sclerotiorum* and *Botrytis cinerea*, both of which spread to the healthy tissues and destroy the plants.

The results of experiments [full details of which are given] showed that the infective principle of the stripe and curl disease is carried in the soil, into which it is presumably introduced with compost from diseased stems, or perhaps on the implements used in tobacco cultivation. The disease is readily spread by infected seedlings planted out in the field. The practical measures for avoiding this type of infection are briefly discussed. No evidence of transmission by the seed was obtained, but infection was transmitted to different varieties of *Nicotiana tabacum*, *N. macrophylla*, and *N. rustica* by the insertion of capillary tubes containing expressed sap from diseased plants into the veins or young parts of the stem. The incubation period was 5 to 6 days for seedlings and 10 to 14 for mature plants (3 to 4 weeks under adverse conditions). Nutritional conditions do not appear to play an important part in the development of this disease. Negative results were given by all attempts to transmit stripe and curl disease to potato and tomato.

MATSUMOTO (T.) & SOMAZAWA (K.). **Immunological studies of mosaic diseases. I. Effect of formolization, trypsinization and heat-inactivation on the antigenic properties of Tobacco mosaic juice. Parts I and II.**—*Journ. Soc. Trop. Agric.*, Formosa, ii, pp. 223–234, 1930; iii, pp. 24–33, 1931. [Japanese summaries.]

Continuing his investigations on the antigenic properties of tobacco mosaic juice [*R.A.M.*, ix, p. 496], the writer tested the following substances for the immunization of rabbits: normal tobacco or tomato juices, untreated mosaic juices, and formolized, trypsinized, and heat-inactivated tobacco mosaic juices. The technique of the various methods of procedure is briefly indicated and the results are tabulated and discussed.

Formolization (the addition of 2 c.c. of commercial formalin to 100 c.c. of the ultra-filtered mosaic juice) did not destroy the precipitogenic property of the juice, but completely inactivated the mosaic principle while the antigenic properties were weakened but not destroyed.

The precipitogenic property of the tobacco mosaic juice was not appreciably altered by digestion with 2 per cent. trypsin. The antigenic properties of the tobacco and tomato mosaic juices were virtually identical, giving further evidence of the close relationship between the infective principles in the two plants, a result which was confirmed by cross tests of precipitin absorption. The antigenic reaction of the virus sap was apparently little affected by the duration of contact with the enzyme (48, 72, or 96 hours). In a series of tests on the effect of trypsin in higher concentrations, the most extensive precipitation was found to occur at 10 per cent. Neither the antigenic properties nor the infective capacity of tobacco mosaic juice were destroyed by trypsinization, though both (especially the former) were somewhat reduced by this process. The comparative resistance to trypsinization of the infective

principle presents an analogy with the bacteriophages, which are generally considered to be capable of withstanding the action of trypsin indefinitely.

The supernatant liquid of mosaic juice was completely inactivated by ten minutes' heating at 90° C. but withstood two minutes at the same temperature and five or ten minutes at 80°.

The results of inoculation experiments indicated that the virulicidal action of the antisera prepared from the trypsin-inactivated and heat-inactivated mosaic juices was very slight, though the incubation period was somewhat lengthened. Antisera prepared from formalin-inactivated juice were almost negative in virulicidal properties, in spite of the positive results obtained in precipitating and complement-fixing capacity. The antibodies responsible for the latter capacities would, therefore, seem to have little or no relation to the virulicidal antibody.

FISH (S.). **'Target spot' of Tomato seedlings. A note on the control of the disease in the nursery.**—*Journ. Dept. Agric. Victoria*, xxix, 3, pp. 132–133, 1 fig., 1931.

After giving a very brief account of a leaf spot of tomato seedlings caused by *Macrosporium* [*Alternaria*] *solani* [*R.A.M.*, x, p. 413], which under favourable conditions frequently kills a large percentage of the seedlings in hot and cool nursery houses in the State of Victoria, the author states that the trouble may be controlled by spraying the seedlings still in the seed-boxes with 6–4–40 Bordeaux mixture, and by repeating the treatment at intervals of three days after the seedlings have recovered from the pricking-out operation. A few practical recommendations are also given for the application and the home preparation of the spray.

VOGLINO (P.). **Le macchie nere del Pomodoro.** [Black spots of Tomato.]—*La Difesa delle Piante*, viii, pp. 1–3, 1931.

In 1928, 1929, and particularly in the autumn of 1930, numerous tomatoes grown in the vicinity of Turin and picked while still green and left to ripen developed large black areas on the skin and in the flesh. These showed the presence of a fungus with ovate-elongated, [ob-]clavate, muriform, fuliginous conidia divided by 4 to 8 transverse and longitudinal septa and measuring 28 to 35 (occasionally 50) by 12 to 18 μ. From these characters the fungus was identified as *Macrosporium lycopersici* [*R.A.M.*, x, p. 493]. Dipping the green tomatoes in 0·5 per cent. copper sulphate gave complete control.

GROSMANN (HELENE). **Beiträge zur Kenntnis der Lebensgemeinschaft zwischen Borkenkäfern and Pilzen.** [Contributions to the knowledge concerning the life partnership between bark beetles and fungi.]—*Zeitschr. für Parasitenkunde*, iii, 1, pp. 56–102, 17 figs., 2 diags., 1930.

Bark beetles (chiefly *Ips typographus*) were shown by the author's studies in Switzerland [which are fully described] to play an important part in the transmission of blue stain fungi (*Ceratostomella* spp.) and other wood-destroying fungi characterized by spores embedded in a viscous liquid. Generally speaking, the

insects appear to be capable of existence without the aid of the fungi, but where these are present the spores and mycelium are consumed by the larva and imago.

In the course of her investigations, the writer observed in the wood of spruce (*Picea excelsa*) the following fungi not hitherto described, German and Latin diagnoses of which are given. *Leptographium penicillatum* n. sp., found in association with *I. typographus* and *Pityogenes chalcographus*, is characterized by a dark mycelium and conidiophores, up to 600 μ in length, with a penicillate apex, bearing acrogenous, falcate, hyaline conidia, 11 to 12 by 3 to 3·5 μ in diameter. A dark blackish-blue discoloration of the wood is produced. *Graphium pycnocephalum* n. sp., also a frequent concomitant of *I. typographus*, has light brown hyphae, hyaline *Graphium*-like fructifications, 700 to 1,000 μ in length, and elongated-oval, hyaline conidia, measuring 6 by 2·2 μ. An intense blue discoloration of the wood is caused by this fungus. *G. adustum* n. sp., accompanying *Dryocoetes autographus*, is characterized by light brown hyphae, *Graphium*-like sporophores, 400 to 700 μ in length, and spherical to oval conidia, 3 by 2·2 μ. A faint, purplish-brown discoloration of the wood is produced. *Dendrostilbella hyalina* n. sp., found in association with *P. chalcographus*, is characterized by completely transparent coremia, 400 to 500 μ in length, hyaline hyphae, and hyaline, oval conidia, 3 by 2 to 2·2 μ in diameter. Material of elm (*Ulmus montana*) examined by the writer was found to be heavily infected by *Scolytus scolytus* and *S. multistriatus*. The bark and wood were permeated by the mycelium of *Graphium ulmi* which produced innumerable coremia in the pupae and on the excreta of the insects. The conidia of the fungus were detected in the intestinal tract of the larvae and imagines, as well as on the chitin. The role of these insects in the transmission of the elm disease is therefore easily understood [see next abstract].

FRANSEN (J. J.). **Enkele gegevens omtrent de verspreiding van de door Graphium ulmi Schwarz veroorzaakte Iepenziekte door de Iepenspintkevers, Eccoptogaster (Scolytus) scolytus F. en Eccoptogaster (Scolytus) multistriatus Marsh in verband met de bestrijding dezer ziekte.** [Some data concerning the dissemination of the Elm disease caused by *Graphium ulmi* Schwarz by the Elm sap beetles, *Eccoptogaster* (*Scolytus*) *scolytus* F. and *Eccoptogaster* (*Scolytus*) *multistriatus* Marsh in connexion with the control of this disease.]—*Tijdschr. over Plantenziekten*, xxxvii, 3, pp. 49–62, 3 pl., 1931. [German summary.]

Further investigations on the part played by the elm sap beetles, *Eccoptogaster* (*Scolytus*) *scolytus* F. and *E.* (*S.*) *multistriatus* Marsh in the dissemination of the elm disease caused by *Graphium ulmi* [*R.A.M.*, ix, p. 350; x, p. 348] in Holland showed that the imagines of the former insect may appear in the early spring and that the swarming period may persist without intermission, under favourable weather conditions, throughout the summer until the late autumn.

Both males and females feed on the trees, preferably on healthy

ones, for an average period of ten days. The occurrence of *G. ulmi* after the feeding of the insects was again observed. Sometimes the wounds inflicted by the beetles heal so completely that their role in the spread of the fungus may not be apparent. Under suitable weather conditions the coremia of the fungus are abundantly produced in the pupae and galleries of *S. scolytus* and to a lesser extent in those of *S. multistriatus*. Owing to the general absence of after-feeding due to the bad weather, positive results (substantiated by the recovery of a pure culture of *G. ulmi*) were obtained only in one case of artificial inoculation with beetles.

Discussing control measures, the writer states that insecticides have so far proved unsatisfactory. It is very easy to entrap the insects with freshly felled trunks, which are immediately invaded by swarms of beetles, but it is necessary to decorticate the trunks within five weeks and to burn the bark. Ichneumonid wasps (*Coeloides scolytycida*) destroy numerous larvae of the beetles, which are further liable to heavy infestation by nematodes and are also extensively devoured by woodpeckers and tits.

GRAVES (A. H.). **Forest pathology.**—*Twentieth Ann. Rept. Brooklyn Bot. Gard., 1930 (Brooklyn Bot. Gard. Record,* xx, 2), pp. 83–87, 1 pl., 1931.

Brief details are given of further experiments made in crossing the low, round-headed Japanese chestnut (*Castanea crenata*) with the tall American species [*C. dentata*] in attempts to produce a race resistant to blight (*Endothia parasitica*) and yet possessing the dimensions and habit of a forest tree [cf. *R.A.M.*, viii, p. 535]. Pollen from the American chestnut was used in the summer of 1930 for the pollination of three Japanese chestnuts under carefully controlled conditions directed to prevent self-pollination; ten nuts were obtained and kept for potting.

Sixty seedlings of a forest type of *C. crenata* planted at Hampden, Connecticut, give promise of furnishing timber for short poles, wood for tannin extract, and desirable stock for crossing.

HIURA (M.). **Observations and experiments on the Mulberry rust caused by Aecidium mori Barclay.**—*Japanese Journ. of Botany,* v, 3, pp. 253–272, 3 pl., 3 figs., 1931.

Near Gifu, Japan, primary infection by the common mulberry rust (*Aecidium mori*) [*R.A.M.*, viii, p. 156] appears towards the end of April, becomes prevalent during the latter part of May, and declines after the middle of June. Aecidiospores transmit infection from one tree to another. Under favourable conditions the first signs of infection may be observed six to eight days after inoculation, but a period of about a fortnight is required for sporulation. The aecidial mycelium hibernates within the basal tissues of dormant buds, from which characteristic hypertrophies are produced in the spring. It has been shown by experiments that the fungus infects the buds while they are very young and remains latent until the following spring, when the buds grow out into yellowish shoots that become covered with the sori of the rust.

These primarily-infected shoots die off, but secondary infections develop on any young organs of the plant. These secondary infections also cause hypertrophy of the young petioles, stems, and flowers, and depressed lesions on older twigs.

All the 43 mulberry varieties tested for their reaction to *A. mori* showed varying degrees of susceptibility. The gradual development of immunity in the foliage of susceptible plants has been demonstrated, the phenomenon being observed in the second to the fifth leaf from the terminal according to the variety and to the different conditions of growth. Generally speaking, the younger the leaves, the more susceptible they are to rust.

In most mulberry plantations the shoots are harvested for silkworm feeding at the beginning of June, thereby avoiding the development of the rust at a period when climatic conditions are favourable.

YAMAUCHI (I.). **On Diaporthe associated with the Mulberry blight 'kangare'.**—*Imper. Seric. Exper. Stat. Bull.* 8, pp. 1–34, 9 pl., 1930. (Japanese, with English summary.) [Abs. in *Japanese Journ. of Botany*, v, 3, pp. (84)–(85). 1931.]

The so-called 'kangare' or blight of mulberry trees prevalent in the snowy regions of Japan was formerly thought to be due to severe cold or to moist heat under snow, but is now generally attributed to *Diaporthe niphonia* (Nomura) Hara, which usually occurs on the lesions in the pycnidial or *Phomopsis* stage with α and β spores, only the former germinating. The perithecial stage of the fungus was obtained and the pycnidial stage developed from a single ascospore; attempts to obtain perithecia in cultures from pycnospores gave negative results. Though the fungus is distributed all over the country, the mulberry blight is confined to snowy localities, healthy plants in warm situations having been shown by inoculation tests to be immune from infection. *D. niphonia*, therefore, is evidently not the primary cause of the blight, although it may be closely connected with the development of the disease.

RÉGNIER (R.). **État actuel de la question du chancre du Peuplier.** [Present state of the Poplar canker problem.]—*Ann. des Épiphyties*, xvi, 2, pp. 83–94, 1 pl., 1931.

In this amplified version of his previous account of the poplar canker disease (attributed by Delacroix to *Micrococcus populi*) in northern France [*R.A.M.*, x, p. 418], the author states that the causal organism is essentially a wound parasite, the distribution of which is ensured by mechanical, human, or animal agency, among which insects are believed to be very active carriers. The transmission of the disease by contact from infected to healthy plants was proved in experiments. Spread appears to be correlated with periods of maximum outflow of bacterial exudate from the cankers, coinciding with the movement of sap in the spring and autumn.

The disease attacks mainly rapidly growing, soft-wooded varieties of poplar, e.g., *Populus angulata*, *P. nigra*, *P. balsamifera*, and *P. canadensis*, although apparently resistant individuals

are occasionally found among these species; *P. alba*, *P. alba* var. *canescens*, and *P. tremula* are normally immune from it, and while Italian poplar (*P. pyramidalis*) is highly resistant, it sometimes bears cankers on the shoots of young trees. In indicating the distribution of the disease in the north of France where it is for the most part limited to well-marked infection centres, it is stated that recent observations indicate its presence in the department of Aube and in the lower Rhine basin, and possibly also in the department of Isère.

The paper terminates with a discussion of the economic importance of the disease, an enumeration of similar diseases that attack the poplar, and control recommendations.

LINDEIJER (EGBERTHA J.). **Een bacterie-ziekte van de Wilg.** [A bacterial disease of the Willow.]—*Tijdschr. over Plantenziekten*, xxxvii, 3, pp. 63–67, 1931.

In the Eemland district of Holland numbers of willow (*Salix alba*) trees have been killed or severely injured of recent years by a bacterial disease first observed by Prof. Westerdijk near Baarn shortly after the detection by W. R. Day in 1921 of what is believed to be the same disease in England, and its attribution by him to *Bacterium salicis* [*R.A.M.*, iv, p. 322].

The first symptoms of the disease are apparent at the end of April or beginning of May, when the leaves of one or more branches of apparently healthy trees suddenly wilt and turn brown. They may remain attached to the tree for some time unless a spell of dry weather sets in, when they shrivel and fall. Simultaneously with or shortly after the wilting of the foliage a bacterial exudate appears here and there on the branches, especially below the leaf axils, probably issuing through wounds freshly inflicted by insects. After the fall of the leaves the diseased branches gradually die off, the process of decay being accelerated by fungous infection. The symptoms generally recur more extensively each succeeding year until the tree is killed, although cases have been observed in which the disease comes to a standstill.

Sections through diseased branches reveal a typical brown discoloration of the wood strikingly similar to that caused in elms by *Graphium* [*ulmi*], small branches, the trunk, and the roots all being liable to infection. In transverse sections the discoloration appears in the form of rings, in longitudinal ones in that of stripes. In the early stages of the disease the discoloration is often confined to one side of the wood, while in later ones the sapwood clearly shows one or more encircling brown rings. The wood is never uniformly discoloured nor is the heartwood alone browned. In this respect the bacterial disease of willows differs markedly from fungous infections of the same host, in which a brown discoloration starts in the heartwood and gradually spreads outwards. Here, as in the elm disease, the discoloration may begin at any point in the sapwood and spread upwards and downwards but hardly in a transverse direction.

The diseased wood vessels contain swarms of bacteria and masses of the brown gum responsible for the discoloration of the wood.

The sap exuding from the cut surfaces of diseased branches is also full of bacteria.

The causal organism, which was readily isolated from infected wood, probably enters through wounds in the branches and multiplies rapidly under favourable weather conditions. The formation of gum and tyloses in the wood vessels hinders the normal transport of water and foodstuffs and ultimately leads to the desiccation and death of the leaves.

The bacterial disease does not appear to be restricted to any particular soil type. In addition to *S. alba*, an unnamed form of this variety and a form of *S. viminalis* are susceptible. The exact mode of dissemination of the bacteria has not yet been determined, but probably wind, rain, and insects play a part. According to Day, infection must occur directly through the wood. Control measures should consist in the use of carefully selected healthy cuttings and in general sanitation of the willow plantings.

RATHBUN-GRAVATT (ANNIE). **Germination loss of coniferous seeds due to parasites.**—*Journ. Agric. Res.*, xlii, 2, pp. 71–92, 1931.

Continuing her studies of the organisms involved in the damping-off of coniferous seedlings [*R.A.M.*, iv, p. 575], the author describes and discusses the results of experiments in which seeds of *Pinus banksiana*, *P. resinosa*, and *Picea engelmanni* were germinated in contact with agar cultures of various fungi [a list of which is given]. Under the conditions of the tests, radicles that had just emerged from the seed coats were attacked and decayed by the following fungi: *Pythium ultimum* (which in former papers had been identified as *P. de Baryanum*) [ibid., vi, p. 510], *P. aphanidermatum, Pythiacystis* [*Phytophthora*] *citrophthora, Phytophthora* spp., *Fusarium sporotrichioides, F. discolor sulphureum, F. arthrosporioides, Botrytis cinerea, F. moniliforme* [*Gibberella moniliformis*], *Phomopsis juniperovora* [ibid., x, p. 71], and some strains of *Rhizoctonia* [*Corticium*] *solani*. Some other species of *Fusarium* were also found occasionally attacking the young radicles, but not frequently enough to give definite evidence of pathogenicity.

All the available lines of *Pythium ultimum* and some of the more virulent strains of *C. solani* were able to attack the seeds before the emergence of the radicles; the same was also true of *P. aphanidermatum, Phytophthora citrophthora, F. sporotrichioides,* and *Phomopsis juniperovora*, but none of the latter group has been isolated from damped-off coniferous seedlings under natural conditions.

The results of the experiments were entirely comparable both in *Pinus resinosa* and *P. banksiana*, with the exception that the seeds of the former showed reduced germination percentages in the presence of strains of *Fusarium* and certain other fungi which did not attack the radicles. *Picea engelmanni* gave some evidence of being more susceptible to seed decay than either of the pines. *Pythium ultimum* and the more virulent strains of *C. solani* caused more apparent germination loss than any of the species of *Fusarium* tested with the exception of *F. sporotrichioides*.

The investigation leads the author to believe that poor germination of pine seed, as a result of the activity of damping-off parasites, is mainly due to the destruction of the radicles after they have emerged from the seed coat but before the seedlings have appeared above ground. Decay of the unruptured seeds would appear to be of lesser importance.

ROTH (C.). **Beobachtungen über die Erkrankung von Weisstannenpflanzen in natürlichen Verjüngungen.** [Observations on the disease of Silver Fir seedlings in natural regenerations.] —*Schweiz. Zeitschr. für Forstwesen*, lxxxii, 3, pp. 87–88, 1 fig., 1931.

Silver fir [*Abies pectinata*] seedlings (two to six years old) covering an area of 1 to 2 hect. in a mixed spruce and fir stand about 100 years old on heavy red marl clay soil with an approximately neutral reaction in the Oberhallau district, Schaffhausen, Switzerland, were observed, in October, 1930, to be suffering from a disease characterized by the following symptoms: yellow discoloration of the needles of the previous year's shoots; shedding of the needles; progressive malformation of the upper part of the tree, the young shoots constantly dying off after one or two years; and constriction and partial healing over of the basal parts of the stem. The disease is thought to be due to a parasitic fungus, and foresters who may encounter it are asked to send material to Prof. E. Gäumann at Zürich.

BOYCE (J. S.). **Decay in Pacific Northwest conifers.**—*Yale Univ. Osborn Bot. Lab. Bull.* 1, 51 pp., 19 pl., 1930.

The information presented in popular terms in this paper, dealing with the importance, nature, stages, types, mode of spread, and other aspects of decay in Pacific Northwest conifers, is stated to be based on the author's 16 years' experience in the forests of the western States, and is intended to assist landowners, timbermen, and foresters in the recognition of the rots of commercially important softwoods.

Douglas firs (*Pseudotsuga taxifolia*) are liable to attack by the ring scale fungus (*Trametes pini*), the velvet top fungus (*Polyporus schweinitzii*), the quinine fungus (*Fomes laricis*), and the rose-coloured conk (*F. roseus*) [*R.A.M.*, vii, p. 352]. Measurements of over 2,600 trees of all age classes with a gross scale of more than 10,000,000 ft. board measure throughout western Oregon and Washington showed a loss of 17 per cent. through decay. Taking this loss as 100, 80·8 per cent. was caused by *T. pini*, 6·2 per cent. by *P. schweinitzii*, 8·6 per cent. by *F. laricis*, and 4·1 per cent. by *F. roseus*. Brown cubical rot (*P. sulphureus*) is almost indistinguishable from that caused by *F. laricis*. Douglas fir trees in second-growth stands swept by ground fires are subject to infection by *P.* [*Polystictus*] *abietinus* [ibid., ix, p. 78], causing pitted sap rot.

Sitka spruce [*Picea sitchensis*] usually remains quite free from fungous infection until the age of 200 years. The most serious damage is caused by *T. pini*, while *Polyporus schweinitzii* and

F. pinicola, the latter producing a brown, crumbly rot, are also common [loc. cit.].

Engelmann spruce (*Picea engelmanni*) is chiefly attacked by *T. pini*, *F. laricis*, and *Polyporus schweinitzii*, while brown stringy rot, caused by the Indian paint fungus (*Echinodontium tinctorium*) [ibid., vii, p. 352], occasionally occurs on this host. White fir (*Abies concolor*) is also very severely affected by the last-named fungus, which further attacks the other balsam firs, viz., *A. grandis*, *A. amabilis*, *A. nobilis*, *A. magnifica*, and *A. magnifica* [var.] *shastensis*, in a milder form. *E. tinctorium* is responsible for losses up to 30 per cent. or more of the stand of western hemlock (*Tsuga heterophylla*).

The most common rots of western or Idaho white pine (*Pinus monticola*) are those caused by *Trametes pini*, *Polyporus schweinitzii*, and *F. annosus*, the last named producing a spongy rot of the sap- and heartwood. Western yellow and Jeffrey pines (*Pinus ponderosa* and *P. jeffreyi*) are relatively free from fungous decay, the principal damage being caused by *T. pini*, *F. laricis*, *Polyporus schweinitzii*, and *P. ellisianus*, the agent of red ray rot [ibid., vi, p. 708]. Lodgepole pines (*P. contorta*) are subject to the same rots as *P. ponderosa*, and the decays of sugar pine (*Pinus lambertiana*) are the same, except that red ray rot has not yet been found on living trees.

Practically all the loss in the incense cedar (*Libocedrus decurrens*) stands is due to the disease known as pocket dry rot, pin rot, or pecky cedar, caused by *Polyporus amarus* [ibid., vii, p. 352]. So common is this defect that it is usual, in cruising, to cut estimates of over-mature stands from 30 to 50 per cent. on account of the decay. *T. pini* is also sometimes found on *L. decurrens*. Western red cedars (*Thuja plicata*) are seriously damaged by yellow ring rot (*Poria weirii*) [ibid., vi, pp. 386, 450], while *Trametes pini* may cause considerable injury in northern Idaho. The same fungus is also found on Port Orford cedars (*Chamaecyparis lawsoniana*).

Western larches (*Larix occidentalis*) suffer heavy damage from the attacks of *F. laricis*, while *Trametes pini* and *Polyporus sulphureus* also occur on this host. Western juniper (*Juniperus occidentalis*), used chiefly as pencil wood, is liable to infection by *F. juniperinus*.

The paper concludes with some general observations on the control of decay by improved silvicultural methods.

VAN POETEREN (N.). **Geen aantasting door Rhabdocline van Abies pinsapo en Abies nobilis.** [No infection of *Abies pinsapo* and *Abies nobilis* by *Rhabdocline*.]—*Tijdschr. over Plantenziekten*, xxxvii, 3, p. 68, 1931.

There is stated to be no basis in fact for Schuphan's allegation of infection of *Abies pinsapo* and *A. nobilis* at Boskoop, Holland, by *Rhabdocline pseudotsugae* [*R.A.M.*, x, p. 141]. The needle fall among these trees was the result of spraying with a paraffin emulsion against insects during sunny weather, and there was no trace of fungous infection on the trees.

SAVULESCU (T.) & RAYSS (T.). **Un parazit al Pinului puţin cunoscut in Europa. Neopeckia coulteri (Peck) Sacc.** [A Pine parasite little known in Europe. *Neopeckia coulteri* (Peck) Sacc.]—*Ann. Inst. Recherches Agron. de Roumanie*, i, 2, pp. 203–254, 1 col. pl., 21 figs., 2 maps, 1930. [French summary. Received May, 1931.]

This is the Rumanian version of the authors' account of *Neopeckia coulteri* on the needles of *Pinus pumilio* in Europe, the French translation of which has already been noticed [*R.A.M.*, ix, p. 75.]

LIESE (J.). **Beobachtungen über die Biologie holzzerstörender Pilze.** [Observations on the biology of wood-destroying fungi.]—*Angew. Bot.*, xiii, 2, pp. 138–150, 3 graphs, 1931.

The writer's previous investigations on the reaction of wood-destroying fungi to toxic substances indicated that low concentrations of a fungicide may exert a stimulatory action on the growth of the organisms, and this was confirmed by further observations and experiments [which are fully described]. It was found, for instance, that *Coniophora cerebella* attacked blocks of fir wood soaked in 0·005 to 0·0005 per cent. solutions of sodium fluoride with greater severity than the untreated controls, and similar observations were made in the case of thanalith, basilit N extra, and a zinc fluosilicate preparation [cf. *R.A.M.*, vii, p. 690]. It is of great practical importance, therefore, to use adequate concentrations of the fungicides. Possibly some of the damage to telegraph poles, &c., recently noticed in Germany, may be ascribed to the use after the war of low concentrations of corrosive sublimate diluted with sodium fluoride instead of the standard 0·75 per cent. for reasons of economy.

Cultures on malt extract agar of a number of wood-destroying fungi were kept in the open for 14 days during the extremely cold weather of February, 1929 (minimum temperature −26° C.) and their viability subsequently determined by subcultures. All the organisms, with the exception of a few strains of the dry rot fungus (*Merulius domesticus*) [*M. lacrymans*], resumed growth after periods ranging from 2 to 14 days, the new cultures being characterized by luxuriant mycelial development, and, in the case of *Schizophyllum commune*, *Polyporus* [*Fomes*] *annosus*, *P.* [*F.*] *igniarius*, *P. applanatus* [*Ganoderma applanatum*], and others, by exceptionally profuse fructifications. Evidently, therefore, the wood-destroying fungi not only suffer no injury from natural cold, but are even stimulated by it to fresh activity.

M. lacrymans also proved more sensitive to heat than any of the other fungi tested, being killed by 15 minutes' exposure to 40° C. *C. cerebella* and *P. vaporarius* [*Poria vaporaria*] were killed in 15 and 30 minutes, respectively, at 50°, *Stereum hirsutum* and *S. sanguinolentum* in 45 minutes at 50°, *Trametes pini*, *Polyporus schweinitzii*, and *Polystictus versicolor* in 30 minutes at 55°, *S. purpureum* in 60 minutes at 55°, *Lentinus squamosus* [*L. lepideus*: ibid., ix, p. 692] and *Lenzites abietina* in 30 minutes at 60°, *Schizophyllum commune* in 45 minutes at 60°, and *L. sepiaria* in 60 minutes at 60°. It was experimentally shown that

the temperature (80° to 100°) at which the coal-tar oil is maintained during the hot impregnation process (lasting 1½ hours for pine, 3 for oak, and 4 for beech) is sufficient to destroy any fungi in the pine sapwood and throughout the interior of the beech, quite apart from the toxic action of the fungicide.

STAUTZ (W.). **Beiträge zur Schleimflussfrage.** [Contributions to the slime flux problem.]—*Phytopath. Zeitschr.*, iii, 2, pp. 163–229, 9 pl., 3 figs., 1931.

The writer's extensive investigations in the Hamburg district of Germany on the slime flux of trees have shown that eight fungi of the section Oosporae of the Mucedineae are found in the exudate, of which two are new species of *Oospora*, viz., *O. klebahni* on elms and *Taxus baccata* (this being apparently the first record of the disturbance on a conifer), and *O. sericea* on oak; two of the new genus *Oosporidium*, namely, *O. margaritiferum* on elms, oaks, and limes, and *O. fuscans* on horse chestnuts (*Aesculus hippocastanum*); and one each of the new genera *Dematoidium* and *Apiotrichum* (*D. nigrescens* on oak and *A. porosum* on oak and *T. baccata*). The morphological and cultural characters of all the fungi are fully described.

Inoculation experiments with the slime taken direct from the trees and also with pure cultures of *O. margaritiferum*, *Oospora klebahni*, and *O. ludwigii* gave positive results in only 3 out of 70 cases, all the affected trees being elms, but no details are given as to the source of the inoculum in each case. Apparently the success of infection depends on the exudation of sap from the host to maintain the inoculum in a damp state.

GIBBS (J. G.). **Club-root in cruciferous crops. Investigation by Plant Research Station.**—*New Zealand Journ. of Agric.*, xlii, 1, pp. 1–17, 7 figs., 1931.

The first part of this paper gives a summarized account of the survey made during the 1927–8 season to determine the prevalence and economic importance of finger-and-toe of cruciferous crops (*Plasmodiophora brassicae*) in various districts of Wellington, Hawke's Bay, and Taranaki provinces of New Zealand [cf. *R.A.M.*, x, p. 283]. The wide distribution and severity of the disease in the areas visited are attributed chiefly to the considerable lack of knowledge among the local farmers and growers of the means of spread of the organism, and to the consequent neglect in taking the necessary precautionary measures. Evidence was also collected indicating that the spores of *P. brassicae* retain their viability for three or four years in the soil.

In the second part some details are given of the experimental investigation of finger-and-toe in 1928 at the Plant Research Station. Preliminary work on rape plants grown in boxes indicated that the greater the number of spores present the more severe is the infection (1 plant out of 42 infected when the number of spores per box was estimated at 25,500, as compared with 43 out of 44 with 530,000,000 spores per box). No evidence was

obtained of the existence of biological strains of *P. brassicae*. There was an indication (supported by statements of growers) that as seed is sown later in the autumn less finger-and-toe appears in the resulting crop. Though no manurial treatment in the one year's experiments controlled the disease, basic slag and sulphate of potash appeared to reduce the intensity of infection. When seed was sown immediately after liming the soil, a control was effected only with 8 tons per acre, while two to three tons of burnt lime gave practical control if applied three or four months before sowing. Freshly slaked quicklime was apparently as effective as the burnt lime. All attempts to isolate the finger-and-toe organism from the seed gave negative results.

The paper terminates with a discussion of the symptomatology and host range of finger-and-toe in New Zealand, and preliminary recommendations for its control, based on these investigations. At present the most resistant swede variety available in New Zealand is the Herning selection from Studsgaard Bangholm, while amongst turnips Green-top and Purple-top Yellow Aberdeen have shown considerable resistance.

KREUZPOINTNER (J.). **Kohlhernie und Düngung.** [Finger-and-toe disease of Cabbage and manuring.]—*Ernährung der Pflanze*, xxvii, 8, pp. 172–173, 1931.

The writer's observations and experiments in Bavaria have shown conclusively that the incidence of finger-and-toe disease of cabbage [*Plasmodiophora brassicae*] is greatly increased by the application to the soil of stable and liquid manure, reaching 90 and 72·5 per cent., respectively, in two test-plots receiving this treatment in 1930, while another, given quicklime in 1928, then a complete fertilizer, and lastly calcium cyanamide, remained entirely free from infection [cf. *R.A.M.*, ix, pp. 693, 700].

JONES (L. K.). **The mosaic disease of Beets.**—*Washington Agric. Exper. Stat. Bull.* 250, 16 pp., 4 figs., 1931.

The yield of beet seed from the 1,200 to 1,500 acres devoted to seed production in Skagit County, Washington, is stated to have fallen off very considerably during the last five years, largely owing to the prevalence of mosaic [*R.A.M.*, x, p. 227].

The outstanding symptoms of the disease in beets grown at 70° F. are dwarfing and precocity of the plants and mottling of the leaves, the light and dark green areas of which are often surrounded by red margins, while scattered red blotches may appear in the interveinal tissue with a reddish coloration of the veins. In plants grown at 50° the symptoms are very indefinite. The leaves are dark green or reddish, but show pale green, circular spots with reddish margins or a mild, yellowish-green, diffuse mottling. In other cases the foliage is characterized by an abnormal diffused, reddish colour, with a few scattered, pale green, slightly sunken spots. Diseased mother beet plants in the field were observed to mature nearly a month earlier than healthy ones.

Beet mosaic has been found to be transmissible from diseased to healthy plants by aphids, but not through contact, transfer of sap

to wounded plants, or by the seed. To test the last-named possibility the writer collected seed from infected plants in 1929 and sowed it in the greenhouse, where not one of the thousand resulting plants contracted mosaic. The infective principle does not appear to overwinter in the soil, but it remains viable on stored beets in pits which act as a source of infection when planted in the field the following spring. The most rapid dissemination of mosaic takes place during the latter part of the summer, and it has been shown that the closer seedling beets are grown to infected mother beets, the greater is the spread of the disease to the former. The average percentage of mosaic in seedling beet plantings adjacent to infected mother beet plantings was 59, compared with only 6 where the former were situated at least 100 yds. from the latter. It was observed in 1930 that the incidence of beet mosaic in the area near the coast of Puget Sound, south-west of Mount Vernon, is very low (only 4 per cent. in 8 beet plantings in June from mother beets produced in the same area the previous season, compared with 52 per cent. in 43 plantings from those in the rest of the beet-growing territory). It is recommended, therefore, that the cultivation of seedlings during the first year should be concentrated near Puget Sound.

Beet mosaic has been observed on garden and sugar beets, mangels, and spinach. Negative results were given by attempts to transmit it to potato and tomato.

Curly top [ibid., x, p. 424] was observed on 2 to 5 per cent. of the beets in most of the plantings inspected in 1930. Plants grown in the greenhouse during the early winter of 1930 showed 27 per cent. infection in the field, while another lot of seedlings from the field developed 15 per cent. curly top in greenhouse trials.

TAKIMOTO (S.). **A soft rot of Sugar Beet and its causal organism.**—*Ann. Phytopath. Soc. Japan*, ii, 4, pp. 350–356, 1931. [Japanese, with English summary.]

An account is given of a bacterial rot of sugar beet causing a yellowish soft rot with a peculiar odour in Heijô, northern Korea. The causal organism was compared with other agents of beet diseases, viz., *Bacterium beticola*, *Bact. serbinowi*, *Bacillus betae*, and *Aplanobacter* (*Bact.*) *teutlium*, as well as with the common soft-rotting organisms *B. aroideae*, *B. carotovorus*, and *B. atrosepticus* [*B. phytophthorus*], and found to be distinct. It is accordingly named *B. betivorus* n. sp. and is described as a short rod with rounded ends, occurring singly, in pairs, or sometimes (in beef bouillon with salts), in long filaments; motile by means of two to six peritrichiate flagella; Gram-negative, non-spore-forming; producing round or amoeboid, homogeneous, thin colonies with a smooth and entire margin on beef agar; gelatine is liquefied and milk coagulated; nitrates are reduced, indol or hydrogen sulphide formed, and gas produced from sucrose or glucose. The organism is facultatively anaerobic or aerobic, the minimum, optimum, and maximum temperatures for growth being 12°, 35°, and 45° C. and the thermal death point 50° (ten minutes' exposure).

RICHARDS (B. L.) & TOMPKINS (C. M.). **The late blight of the Sugar Beet.**—*Phytopath.*, xxi, 3, pp. 289–314, 4 figs., 1931.

Late blight of sugar beets, a non-parasitic disease characterized primarily by a somewhat sudden collapse of the leaf tissue, may not be accompanied by the dry or *Phoma* rot usually considered to be the typical feature of the disturbance [*R.A.M.*, ii, p. 89]. The root rot that usually accompanies or follows leaf collapse is induced in Utah by *P. betae*, which attacks the root only after the resistance of the plant is seriously impaired. Under persistently dry conditions root rot may not succeed leaf blight as an important characteristic of the disorder.

The occurrence of late blight is correlated in Utah with abnormally low precipitation during the period from June to August, as in 1919 and 1921, when the disease assumed an epidemic form. Locally the symptoms may be induced at any time by cultural practices resulting in poor soil tilth, low soil fertility, or any conditions calculated to disorganize the water balance of the plants. Excessive alkalinity, high calcium, and high organic content of the soil, especially in conjunction with lack of moisture, appear to augment the incidence of late blight.

The problem of control is complex: under Utah conditions an attempt should be made to improve cultural practices in such a way as to bridge over the critical summer months when the beets are liable to become weakened, and to promote vigorous and uninterrupted growth.

WALKER (J. C.). **Resistance to Fusarium wilt in garden, canning and field Peas.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 107, 15 pp., 4 pl., 1931.

The *Fusarium* wilt of peas, caused by *F. orthoceras* var. *pisi* [*R.A.M.*, ix, p. 423], is stated to be increasing in extent and severity in Wisconsin, and has been reported by B. L. Wade and L. K. Jones in correspondence to occur in the Palouse section of eastern Washington and north-western Idaho. Full details are given of the writer's studies on the reaction to this disease of a large number of important Wisconsin varieties. It was found that Perfection, one of the chief varieties grown in the State, is highly susceptible, while Alaska, another standard variety, is very variable in its reaction to wilt, the number of resistant plants in different stocks ranging from 0 to 100 per cent. Among other susceptible canning varieties may be mentioned Canners' Gem, Horsford, Ashford, Surprise, Badger, Rice's 13, Winner, Laxtonian, Onward, and Thomas Laxton, while the resistant group includes Green Admiral, Yellow Admiral, Roger's K, Prince of Wales, Senator, Bruce, Horal, Rice's 330, and Improved Surprise. Considerable variations in susceptibility to wilt were also found among field peas, e.g., Canada Field and Victoria.

JONES (L. K.). **Factors influencing the effectiveness of organic mercury dusts in Pea-seed treatment.**—*Journ. Agric. Res.*, xlii, 1, pp. 25–33, 1 graph, 1931.

This is a brief report of the results obtained in the author's continued investigation of the influence of treating healthy pea seeds

with various organic mercury dusts on the germination of the seed and on the density of stand of the resulting crops [*R.A.M.*, vii, p. 612]. Field tests in 1928 in the vicinity of Geneva, New York, and greenhouse experiments in various localities, in which 800 1,000-seed lots and some 40 different organic mercury preparations were used, showed that the dusts containing at least 12 per cent. mercury phenolate were the most effective in increasing the stand of plants, uspulun and semesan giving the most consistent results (11 and 10 per cent. increase in stand, respectively). Dusts containing 6 per cent. or less of chlorphenol mercury, nitrophenol mercury, or cresol mercury were of little value. The application of water to the soil immediately after sowing greatly reduced the percentage germination of untreated seeds, much more so in the sweet wrinkled varieties than in Alaska peas, while the application of water 24 or 48 hours after sowing did not affect to any great degree the germination of the latter variety. Semesan dust was effective in increasing the germination of the seed under various soil moisture and soil temperature conditions, its beneficial action being greatest, in general, on the sweet wrinkled varieties. With the Alsaka variety, seed treatment appeared to assure a good stand independently of the moisture and temperature conditions of the soil. Generally speaking, the results of the investigation indicate that variations in soil moisture and temperature at the time of sowing play a considerable part in the results obtained from seed treatment, a fact which may account to a large extent for the contradictory reports in literature on the value of this practice.

JENKINS (ANNA E.). **Scab of Canavalia caused by Elsinoe canavaliae.**—*Journ. Agric. Res.*, xlii, 1, pp. 1–12, 4 pl., 1931.

This is an account, based on the descriptions of former workers and supplemented by the author's recent observations of herbarium material preserved in the United States, of a disease (which is termed scab because of its similarity to citrus scab due to *Sphaceloma fawcettii*) of *Canavalia gladiata* and probably *C. ensiformis* caused by *Elsinoe canavaliae* Rac. [*R.A.M.*, ix, p. 66]. Formerly reported from Java, the Philippines, and Ceylon, the disease was recently observed in Singapore, and it is believed to be one of the major troubles of the species of *Canavalia* susceptible to its attacks. In describing the morphological characters of *E. canavaliae*, the author states that in the material examined by her she saw small, spherical, hyaline bodies which are interpreted as microconidia, and which are similar to those recently described in *S. symphoricarpi* [ibid., ix, p. 723] and *S. fawcettii*. The specimen from Singapore contained both asci and spores apparently more mature than those described by Raciborski or than those seen by Arnaud. The largest asci, which were clavate and supplied with a short stipe, attained a size of 24 to 30 μ, while the largest spores, some of them still in the ascus, measured 28 by 9 μ. The more mature spores ranged in colour from hyaline to yellowish or greenish-yellow. The transverse septa were well defined, but no longitudinal septa were seen.

A full discussion is given of the taxonomic status of *E. cana-*

valiae, and while noting its transference by Arnaud [cf. ibid., v, p. 330] to the genus *Uleomyces*. the author considers it preferable to retain its original generic name until fresh data are collected, which will allow of a further discussion of the synonymy of these two genera and of others closely related to them. In regard to the latter it is stated that microconidia representing the hitherto unreported conidial stages of *U. sanguineus* (Speg.) Syd. and *Myriangina mirabile* P. Henn. were also observed by the author in the herbarium material studied by her.

JENKINS (ANNA E.). **Lima-Bean scab caused by Elsinoe.**—*Journ. Agric. Res.*, xlii, 1, pp. 13–23, 5 pl. (1 col.), 1931.

This is a detailed account of the destructive disease of Lima beans (*Phaseolus lunatus* [var.] *macrocarpus*) in Cuba and Porto Rico, a brief reference to which has already been noticed [*R.A M.*, ix, p. 756]. The most conspicuous symptom is the appearance of characteristically thickened, raised, or swollen lesions first developing on the younger growing parts of the hosts, and bearing the same general character and appearance as those of the *Canavalia* scab [see preceding abstract]. On the leaves the lesions are usually more pronounced on the upper than on the lower surface, and from a few to several hundred may occur on one leaf. They are usually circular, ranging from minute dots to about 4 mm. in diameter, and of varying tinges of brown. Diseased leaves may be distorted or they may become broken and torn owing to the dropping-out of the affected parts. The lesions on the petioles are rough and pinkish-brown, and may involve the entire surface. On the stems the individual lesions are often somewhat raised, ranging from minute spots to elliptical or elongated areas 1 cm. or more in length, generally of a vinaceous buff colour, and sometimes bordered by a purplish-brown band of varying width. On green pods the lesions are irregular, elliptical, or subcircular, of varying size up to 8 mm. and over in greatest diameter. Where the spots are numerous or confluent, the entire surface of the pod, or sometimes of only one valve, may be affected. The lesions may not be noticeably raised, and occasionally they are somewhat sunken. The colour varies considerably even in spots of the same age, and ranges through various shades of red and brown. None of the lesions examined penetrated the ovary wall.

Morphologically the causal organism closely agrees with *Elsinoe canavaliae*, with which it is tentatively (but not definitely) identified. In the material examined a few conidia were seen actually attached to the conidiophores, and consisted of hyaline, spherical microconidia identical with those reported for *E. canavaliae*, and ovoid or elliptical, pale-coloured conidia about 10 by 4 μ in size; younger or hyaline conidia of the latter type have not been seen on Lima beans in nature, but were abundant in young cultures on agar. The largest asci on Lima beans were somewhat larger and more stipitate than those seen on *Canavalia* spp.; those of which the wall was still intact reached 40 μ in length by 30 μ in width. The asci are provided with a double wall, which was not reported previously in this genus of the Myriangiales, and which was not specially studied by the author. It was also

observed that, instead of containing ascospores, the apparently undifferentiated ascus was sometimes filled with microconidia which are seemingly set free in a body. The brown and muriform ascospores not previously observed, although believed by Arnaud [ibid., v, p. 330] to occur in *E. canavaliae* when fully mature, were seen in the fungus on Lima bean; they commonly produced spherical microconidia or larger, ovoid or elliptical conidia on germination.

De la Reille (C.). **La résistance des hybrides au mildiou et la qualité de leurs vins.** [The resistance of hybrids to mildew and the quality of their wines.]—*Prog. Agric. et Vitic.*, xcv, 6, pp. 133–135, 1931.

In this paper brief notes are given on a number of vine hybrids which have shown outstanding resistance to mildew [*Plasmopara viticola*] in 1930, when grown on their own roots. Some of these hybrids, e.g., Couderc's 7120, produced an excellent and entirely healthy crop without any treatment, while others required one or two applications of a cupric spray at the most. The quality of the crop produced by each of the hybrids is also indicated.

Ravaz (L.). **L'enquête sur le mildiou. Conclusions.** [The inquiry on mildew. Conclusions.]—*Prog. Agric. et Vitic.*, xcv, 5, pp. 101–109; 7, pp. 149–154, 1 col. pl., 1931.

The results of the inquiry on the incidence and control of vine mildew [*Plasmopara viticola*] in France in 1930 [*R.A.M.*, x, p. 290] once again fully demonstrated the efficacy of cupric sprays in the control of the disease, the cases of partial or total failure being attributable to extraneous causes and still more to faulty preparation or application of the sprays. Vineyards on hilly slopes were, in general, earlier and more severely attacked than those in the plains, this being ascribed to the fact that hills were the first to be reached by the warm thunderstorm rains which prevailed during early spring, and also to their greater exposure to direct sunlight. Suckers that develop at the base of the stocks, when the latter are opened up by spring cultivation, were shown to be very susceptible to primary infection, and to be a dangerous source of secondary infection; their formation should be prevented by cultural methods, or else they should be removed as soon as they appear. A clear relationship was established between the severity of the disease in 1930 and its prevalence in the vineyards during the foregoing autumn, as those that had been free from mildew in 1929 were attacked much later in the season and to a lesser degree. The lowest temperature at which the spores of *P. viticola* were observed to germinate in nature was 11°C., when the process took at least three days; at 14° to 15° the germination also occurred more or less slowly, while at 18° to 19° it was completed in two or three hours. There was clear evidence that vineyards may be infected by wind-borne spores coming from a distance of several kilometres.

The best protection against mildew was afforded by the higher copper sulphate concentrations of the mixtures; lower concentrations were only effective when applied at shortened intervals and

in large quantities. Mixtures made from powdered commercial Bordeaux or Burgundy mixture (nearly all used were the latter) were not entirely effective at the doses indicated by the makers, owing to their relatively low content of copper. In rainy years like 1930 spraying should be started as early as possible, and repeated at intervals of six or seven days, which corresponds to the incubation period of the fungus. Cupric dusts were ineffective when used alone, owing to their lack of adhesiveness, but were useful in protecting the bunches from infection when applied between the sprays.

CADORET (A.). **Les leçons du mildiou en 1930.** [Lessons from mildew in 1930.]—*Prog. Agric. et Vitic.*, xcv, 8, pp. 187–188, 1931.

The author states that the main lesson to be derived from the disastrous outbreak of vine mildew [*Plasmopara viticola*] in France in 1930 (which is estimated to have reduced the wine production by over 20 million hectolitres) is the necessity of thinning out the foliage of the vines during the whole vegetative period, so as to render the grape bunches easily accessible to fungicidal sprays and dusts. Observations in 40 vine-growing departments showed that the disease was least severe in vineyards with weaker growth grafted on Berlandieri or Riparia stocks and orientated from north to south, so as to ensure a good aeration of the plants. Nitrogenous manures, even in the form of sodium nitrate alone, showed no evidence of predisposing the plants to mildew.

D'HERBÈS (J.). **Observations sur le mildiou.** [Observations on mildew.]—*Prog. Agric. et Vitic.*, xcv, 7, pp. 163–164, 1931.

The author states that his experience in his vineyards in the south of France in 1930 showed that cupric sprays do not protect the grapes from mildew [*Plasmopara viticola*] when the foliage of the vinestocks has attained its full development. Dusts are much more effective in this regard.

CONSTANT (G.). **Le mildiou en Touraine.** [Mildew in Touraine.] —*Prog. Agric. et Vitic.*, xcv, 5, pp. 115–117, 1931.

As elsewhere in France [see preceding abstracts] the vineyards in the department of Indre-et-Loire were severely damaged by mildew [*Plasmopara viticola*] in 1930, the total yield having been reduced to just over 391,100 hl. as against 1,356,900 hl. in an average normal year. Some growers, however, who strictly adhered to the control schedule recommended, were successful in saving a large proportion, if not the whole, of their crop, even on soil retaining water for considerable periods of time. The experience last year again confirmed the value of one or two early spring applications of a cupric spray, which considerably delayed and minimized primary infection; the first sprays were for the most part made at low concentrations (1·5 or 2 per cent.), but these were gradually increased to mixtures containing 3, 4, and occasionally 6 per cent. copper sulphate. In a small comparative experiment a 3 per cent. mixture afforded better protection of the grape bunches than a 2 per cent. one. Many growers stressed the

benefit derived from supplementary treatment of the vines with cupric dusts, the usual practice being the application of three dustings either at the beginning of the fruiting period (as soon as the bunches become visible), or towards its end. The dusts are particularly useful where the spraying is done by means of horse-drawn apparatus.

KALÉ (G.) & RIVES (L.). **À propos des causes d'inégale résistance d'une vigne au mildiou.** [With reference to the causes of unequal resistance of a Vinestock to mildew.]—*Prog. Agric. et Vitic.*, xcv, 6, pp. 138–139, 1931.

In referring to the opinion recently expressed by Ravaz (*Prog. Agric. et Vitic.*, xciv, 51, pp. 596–598, 1930) that the immunity of American vine varieties and their hybrids from mildew [*Plasmopara viticola*] in the spring, and their relative susceptibility to the disease in the autumn, are probably due to the high concentration of their cell sap at the start of vegetation and its progressive dilution as the season advances, the authors state that cryoscopic tests [some details of which are given] have shown that no significant difference exists in the concentration of the cell sap of highly resistant and of highly susceptible varieties or hybrids.

CAPUS (J.) & BOURDEL. **Pluie et mildiou.** [Rain and mildew.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 10, pp. 328–334, 1931.

Attention is drawn to the correlation between a heavy rainfall during the winter months and an epidemic of vine mildew [*Plasmopara viticola*] in the following summer. The severe outbreaks occurring in most parts of France during 1930 [cf. *R.A.M.*, x, p. 154] were preceded by a wet winter (October to April), as was also the case in 1915, a year of exceedingly heavy infection. Similar conditions obtained in 1903, 1910, and 1913. When the winter months are dry little damage is caused by mildew, even if May and June are wet. In the south-west June is the critical month for the development of the fungus. When the winter rainfall considerably exceeds the mean of 512 mm., the fungicidal treatment should be commenced early in May [cf. ibid., x, p. 358]. In Gironde, where the mean monthly rainfall has been calculated over a lengthy period, and where the forecasting stations of Cadillac and Bordeaux have studied the critical times of infection since 1898 and 1922, respectively, systematic fungicidal treatment against vine mildew should present no difficulties.

KRAMER (O.). **Die Anwendung neuer Rebschädlingsbekämpfungsmittel in der württembergischen Praxis.** [The application of new preparations for the control of Vine pests in practice in Württemberg.]—*Nachricht über Schädlingsbekämpf.*, vi, 1, pp. 1–10, 6 figs., 1931.

The writer states that nosprasen [*R.A.M.*, viii, p. 700] is becoming increasingly popular in Württemberg for the combined control of *Peronospora* [*Plasmopara viticola*] and insect pests of the vine. It has also proved very efficacious against 'roter brenner' [*Pseudopeziza tracheiphila*]. Nosprasen has been found

particularly valuable in the early applications, when the tender shoots of the vines are most liable to the scorching produced by Bordeaux mixture.

GESSNER (A.). **Prüfung von Rebschädlingsbekämpfungsmitteln im Jahre 1930.** [The testing of preparations for the control of Vine pests in the year 1930.]—Reprinted from *Weinbau und Kellerwirtsch.*, x, 7–8, 6 pp., 1931.

Adequate control of *Peronospora* of the vine [*Plasmopara viticola*] was given in a series of tests conducted at the Baden Viticultural Institute, Freiburg i. Br., during 1930 by the following dusts: P. 210 (Pflanzenschutz G.m.b.H., Hamburg), Schering 240 (Schering-Kahlbaum, Berlin), cupulvit (L. Meyer, Mainz) [*R.A.M.*, viii, p. 755], kupferpulver 124 (Chem. Fabrik Noerdlinger, Flörsheim), Horst's kupferstaub (Horst & Co., Bingen, Rhein) [ibid., viii, pp. 85, 482], Sch. 878 (I. G. Farbenindustrie A. G., Höchst), and cusisa (Chem. Fabrik E. Merck, Darmstadt) [ibid., viii, p. 85].

In the Palatinate, where *Oidium* [*Uncinula necator*] was very severe during the period under review, ventilato [wind-blown] sulphur [ibid., viii, p. 701] was the only preparation giving effective control.

IKATA (S.) & HITOMI (T.). **A new leaf-blight disease of the Grape-Vine.**—*Ann. Phytopath. Soc. Japan*, ii, 4, pp. 357–373, 2 pl., 2 figs., 1931. [Japanese, with English summary.]

In August, 1925, a hitherto undescribed leaf blight of vines was observed near Okayama, Japan. The disease may be recognized by the large, concentric, brown spots on the leaves, which are prematurely shed. The symptoms persist from the end of July until November. The new blight may be distinguished from the similar well-known disease due to *Isariopsis clavispora* [*Cercospora viticola*: *R.A.M.*, ix, p. 613] by the target-board effect given by the concentric spots.

The causal organism of the leaf blight, which is named *Acrospermum viticola*, is characterized by scattered, free, superficial, lanceolate or clavate, black, leathery, thick-walled perithecia, 900 to 2,100 μ in length by 195 to 445 μ broad; and hyaline, cylindrical, thin-walled asci, 225 to 413 by 2·5 to 3·5 μ, containing eight hyaline, very slender, non-septate ascospores, 152 to 280 by 1 to 2 μ (average 189·5 by 1·5 μ). The conidial stage of the fungus, belonging to *Spondylocladium* or *Acrothecium*, is characterized by 1- to 5-septate, usually simple, pale brownish-yellow conidiophores, arising singly from the subepidermal mycelium and measuring 30 to 300 by 3 to 4 μ, including the secondary conidiophores (arising below the apex of the main stalk) which are 1- to 3-septate and measure 25 to 90 by 3 to 4 μ; the verticillate, cylindrical, or ellipsoid, pale yellowish-grey, 1- to 2- (sometimes 3- to 4-) septate conidia measure 7·5 to 16·3 by 2 to 6 μ (average 10·8 by 2·7 μ).

The fungus makes good growth on a number of standard media, producing abundant conidia but no perithecia. Inoculation experiments with conidia or ascospores resulted in the infection of

American vines (*Vitis labrusca*) varieties but not of the European (*V. vinifera*). The incubation period is about 15 to 20 days for ascosporal infection and 15 or 16 when conidia are used. The germ-tubes of the fungus penetrate the leaves through the stomata. Primary infection can only be established by the ascospores, since the viability of the conidia does not extend beyond May at the latest. Perithecial formation begins in November and that of ascospores in the following June and July. The optimum temperature for the growth of the fungus is 20° to 25° C.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom. 1929–1930.—280 pp., London, H.M. Stationery Office, 1931.

This volume, issued under the joint auspices of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland, and the Ministry of Agriculture for Northern Ireland, is designed to present in a convenient form the progress of agricultural research conducted by State-aided Research Institutes and other centres in the United Kingdom during the academic year 1929–30. Some of the results reported herein have already been noticed from other sources. The following are some further items of phytopathological interest. At the Plant Pathological Laboratory of the Ministry of Agriculture and Fisheries, Harpenden, *Leptosphaeria heterospora* was reported on the roots and rhizomes of *Iris germanica* [*R.A.M.*, viii, p. 382], and a fungus provisionally identified as *Kabatiella microsticta* was observed to cause leaf spotting of *Lilium umbellatum* and *L. wilmottiae* [ibid., viii, p. 725]. Both these organisms are stated to be new to the British flora. Furthermore, *Stagonospora curtisii*, hitherto known only on narcissus [ibid., ix, p. 318], was found to cause a destructive rot of *Galanthus byzantinus*.

One of the principal objects of the work at the Potato Virus Research Station, Cambridge University, is the isolation and multiplication of virus-free potato stock. During the period under review, stocks of Arran Crest, Champion, Di Vernon, Eclipse, Kerr's Pink, and Majestic were added to those already isolated. The yield of a virus-free stock of Up-to-Date, which has been tested for three years, was so high as to recall the period 25 years ago when this variety produced outstanding crops and extremely large tubers.

The Institute's stock of the King Edward variety, which carries in a latent form 100 per cent. of paracrinkle [ibid., x, p. 49] but is free from all other virus diseases, has been induced to display the paracrinkle symptoms by being kept in store until July and allowed to grow long sprouts. As its latency has hitherto been very complete, it is hoped that modifications in dormancy may act similarly on other carriers.

An Up-to-Date potato, carrying a latent streak virus [loc. cit.], produced a faint dark-green mottle when grafted on to black nightshade (*Solanum nigrum*). When a mottled *S. nigrum* plant was grafted on to woody nightshade (*S. dulcamara*) no symptoms

developed, but the virus was recovered from the latter by grafting (not by aphids) [see below, p. 615]. *S. dulcamara* is thus shown to be a perfect carrier of the streak virus. A new plant virus has been detected originating in the dandelion (*Taraxacum*) [*officinale*]. It is transmissible under certain conditions to various members of the Solanaceae, including potato, tomato, tobacco, *Datura* [*stramonium*], and *S. nigrum*.

In the Bristol district *Septoria* [*Mycosphaerella*] *fragariae* [ibid., ix, p. 159] was found to be the cause of a destructive blossom blight and fruit spot of strawberries, the Sir Joseph Paxton variety being chiefly affected.

The basket willow (*Salix triandra* and *S. viminalis*) rusts occurring in the Bristol district were identified as *Melampsora amygdalinae* and *M. larici-epitea*, respectively.

At Manchester University the percentage of ergot (*Claviceps purpurea*) infection in rye [ibid., vii, p. 505] was greatly reduced by the separation of diseased grains from the seed prior to sowing by floating in a saline solution, which further accelerated growth and strengthened the stalks. From a 1 cwt. bag of seed $1\frac{1}{4}$ lb. of pure ergot (1·11 per cent.) was separated out by this method.

Extensive trials at Reading University showed that the germinator method of testing swede stock for infection by *Phoma lingam* [ibid., ix, p. 623] is much more satisfactory than growing seedlings under moist conditions in sterilized soil or than the agar plate method. Two commercial samples of seed were found with the unusually high infections of 1 and 3 per cent. While soil continues to be the primary source of infection for the most severe cases of dry rot and canker in the field, high percentages of disease in the seed can be experimentally produced by spraying with spore suspensions of *P. lingam* at the critical time [cf. ibid., ix, p. 219]. *Brassica alba*, occurring freely as a weed in Dorset swede fields, has been found infected by a fungus probably identical with *P. lingam* and is thought to play an important part in the transmission of the disease.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1928. [Diseases and pests of cultivated plants in the year 1928.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 41, 64 pp., 2 graphs, 27 maps, 1931.

For reasons of economy only the most important fungous diseases and insect pests of cultivated plants are included in this report [cf. *R.A.M.*, ix, p. 579], reference being made in the footnotes to other items of phytopathological interest appearing in the monthly reports of the German Plant Protection Service. This change in the usual mode of procedure does not apply to the silvicultural section. The distribution in Germany of the following diseases during 1928 is shown by means of maps: loose smut and stripe disease of barley (*Ustilago nuda* and *Helminthosporium gramineum*), white ear [ibid., x, p. 489] and soil acidity diseases of cereals, blackleg and scab of potatoes (*Bacillus phytophthorus* and *Actinomyces* sp.), and heart and dry rot of beets [ibid., ix, p. 697].

UPPAL (B. N.). **Appendix M. Summary of the work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1929–30.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1929–30*, pp. 233–236, 1931.

During the period under review sorghum smut [*Sphacelotheca sorghi*: *R.A.M.*, ix, p. 505] was effectively controlled by sulphur dusting even at so low a rate as 3 oz. of sulphur per 60 lb. of seed. When sulphur was used in quantities ranging from 8 to 64 oz. per 60 lb. of seed, the seed still germinated normally. Arrangements have been made to supply sulphur in packets containing a sufficient quantity to treat enough seed to sow eight acres, each packet costing only 9 pies [three farthings].

Fig rust [*Kuehneola fici*] was controlled by five sulphur applications, each at the rate of 120 to 150 lb. per acre, made at intervals of 7, 15, and 30 days for about three months; the treatments at one month intervals were the most suitable as these did not injure the foliage and young fruits. Taking into account the time spent in making the applications the total cost did not exceed 12 rupees [18*s.*] per acre, and could be still further reduced.

A serious wilt of sunn hemp [*Crotalaria juncea*] due to a species of *Fusarium* was present in one locality since 1928.

During the monsoon period a very large majority of deaths among betel vines [*Piper betle*] were caused by a species of *Phytophthora* [ibid., x, p. 223], *Sclerotium rolfsii* being responsible to a much smaller extent. Field tests showed that *S. rolfsii* can be controlled by applications of fungicides to the soil, and pot experiments with *Phytophthora*-infested soil indicated that Bordeaux mixture may control this infection in the field.

HOPKINS (J. C. F.). **Plant pathology in Southern Rhodesia during the year 1930.**—*Rhodesia Agric. Journ.*, xxviii, 4, pp. 384–389, 1931.

In 1930 white mould of tobacco (*Erysiphe cichoracearum*) was destructive in some parts of Southern Rhodesia, but the heavier types of tobacco now grown, such as Orinoco White Stem and Warne, appear to offer resistance to the disease. Late rains after prolonged drought led to very severe frog eye (*Cercospora nicotianae*) on late maturing tobacco.

Field studies of red rust of tobacco [*R.A.M.*, ix, p. 415] left little doubt that it is a physiological disease resulting from the plant suddenly absorbing nutritive material (especially nitrogen) from the soil, the normal outlet for which nutriment—growth—is interfered with by topping. Judging by the dark bluish-green appearance of the leaves just before spotting occurs, the plants would appear to be suffering from an excess of nitrogen.

Observations showed that with very heavy leaf, such as that of the Western variety, the normal mottling caused by tobacco mosaic is masked, a severe white spotting occurring instead, and sometimes spreading over the whole leaf, rendering it quite valueless.

The death of young maize seedlings was found to be due to species of *Penicillium*, *Aspergillus*, and *Rhizopus* as well as to *Diplodia zeae* and *Gibberella saubinetii* [ibid., ix, p. 119]. Under field conditions the first three are seldom serious, but the *Rhizopus*,

which is probably *R. nigricans,* has caused severe losses in certain localities.

Treatment of maize seed with tillantin R against ear rots [due to *D. zeae* and *G. saubinetii*: loc. cit.] gave satisfactory results.

Angular leaf spot and bacterial boll disease of cotton (*Bacterium malvacearum*) [ibid., viii, p. 306; ix, p. 591] were widely prevalent, but the blackarm phase of the infection was not noticeable.

Several isolations of Phycomycetes, including *Phytophthora parasitica* on *Antirrhinum* and rhubarb, and *Pythium ultimum* [ibid., x, pp. 500, 569] on *Cupressus* seedlings, constitute the first records of this group of fungi in Rhodesia.

Other new records include *R. nigricans* and *Alternaria macrospora* on cotton, *Physoderma zeae-maydis* on maize, *Verticillium* wilt and ring spot virus disease of tobacco, *Corticium salmonicolor* on apple and pear, *Macrophomina phaseoli* and *Helicobasidium purpureum* (both in the *Rhizoctonia* stage) on soy-bean, and a *Cercospora* morphologically indistinguishable from *C. gossypina* on *Hibiscus*.

Forty-first Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1930.—38 pp., [? 1930. Received June, 1931.]

The following items of phytopathological interest occur in this report. Much progress is reported by W. A. Gardner to have been made in the testing of sweet potato varieties for resistance to black rot [*Ceratostomella fimbriata*: *R.A.M.*, x, p. 86].

Ascochyta pisi and *A. pinodella* [*R.A.M.*, x, pp. 293, 422] are stated by J. L. Seal to be of frequent occurrence in winter pea and vetch fields, where they often act as limiting factors in the cultivation of this crop. *A. pisi* is found chiefly on the aerial parts of the plants, while *A. pinodella* is restricted to the lower stem and underground parts. Various species of *Pisum*, *Lathyrus*, *Vicia*, and *Vigna* are liable to infection by these organisms, which persist from one season to the next on their hosts or on plant refuse in or on the soil.

Twenty-eighth Annual Report of the Bureau of Science, Philippine Islands, for the year ending December 31, 1929.—87 pp., 1930. [Received June, 1931.]

The following items of phytopathological interest occur in this report. The most effective measure against stem rot of rice (*Sclerotium*) [*oryzae*: *R.A.M.*, ix, p. 484] in Ilocos Norte was found to be draining off the water from the soil, adding more only when the ground began to bake. Good results were also obtained in the Alabang district by burning the rice stubble in diseased fields, followed by ploughing and the adoption of measures to prevent the transmission of infection by labourers or animals. In Pampanga the cultivation of the highly susceptible Inachupal and Macan China varieties has been discontinued by one large planter who has replaced them by the very resistant and prolific Ramai.

Cinchona trees up to seven years old were killed off in large numbers at Baguio by a very destructive bark disease.

STOCK (F.). **Untersuchungen über Keimung und Keimschlauchwachstum der Uredosporen einiger Getreideroste.** [Investigations on the germination and germ-tube growth of the uredospores of some cereal rusts.]—*Phytopath. Zeitschr.*, iii, 3, pp. 231–279, 3 figs., 21 graphs, 1931.

The writer's extensive investigations and experiments [which are fully discussed and tabulated] on the conditions governing the germination of *Puccinia triticina*, *P. dispersa* [*P. secalina*], *P. coronifera* [*P. lolii*], and *P. graminis* [*R.A.M.*, x, p. 441] showed that all these rusts require practically 100 per cent. atmospheric humidity for the initiation of the process. The uredospores of *P. secalina* germinated freely throughout a temperature range of 9° to 22·5° C., the corresponding figures for *P. graminis*, *P. triticina*, and *P. lolii* being 11° to 23°, 12·5° to 25°, and 14° to 25·5°, respectively. The optimum temperatures for germ-tube development were as follows: *P. secalina* 10°, *P. triticina* 10° to 15°, *P lolii* 15° to 20°, and *P. graminis* about 20°. The oxygen requirements of the rusts are extremely slight, a trace being sufficient to allow of germination. The uredospores of *P. triticina*, *P. secalina*, and *P. lolii* germinated equally well in light or darkness, but the development of *P. graminis* was distinctly checked by light. Even at a concentration of 1 per cent., carbonic acid slightly retarded germ-tube development, while higher concentrations (up to 20 per cent.) caused proportional delay in germination and germ-tube growth. *P. graminis* made equally rapid germ-tube growth on acid and alkaline media (P_H 4·6 to 7·2), *P. secalina* also flourished at P_H 8·0, while *P. triticina* and *P. lolii* preferred media with an acid reaction (P_H 4·6 to 6·0). All attempts to culture the mycelium developing from the uredospores gave negative results.

BROADFOOT (W. C.). **Preliminary experiments on the control of cereal rusts by kolo dust.**—*Phytopath.*, xxi, 4, pp. 347–372, 1931.

Full details are given of experiments conducted at three localities in Minnesota in 1927, to test the efficacy of kolo dust in the control of stem and leaf rusts of wheat [*Puccinia graminis* and *P. triticina*: cf. *R.A.M.*, x, p. 441], the data being presented in tabular form. The varieties used in the tests (for which over 2,000 plots were employed) were Marquis and Ruby (common bread wheats) and Mindum, representing the durum types.

The mean averages of the data on the Marquis plots at the three places, dusted three times with kolo, show up to 80·2 per cent. reduction in the incidence of stem rust; 57·1 per cent. increase of yield; and 13·7 per cent. increase in weight per bushel. The most effective schedules for three applications of kolo dust at the three stations, from the standpoint of timeliness of application, were the flowering-time +6+4, or flowering-time +8+4, i.e., the second application being made 6 or 8 days after the first, and the third 4 days after the second. Applications at the rates of 15 and 30 lb. per acre at each dusting were found to be substantially as

effective as 45 and 60 lb. The mean averages of the data on the Marquis plots given two applications of kolo dust show up to 50·3 per cent. decrease in the amount of stem rust; 39·7 per cent. increase of yield; and 10·8 per cent. increase in weight per bushel. The most effective schedule for two applications was flowering-time +6 or +8. In this case also the 15 and 30 lb. rates were found to be adequate, and altogether for practical purposes two applications of kolo dust are almost equally effective with three. Both with two and three applications the grade of the wheat was superior to that of the untreated. Although no appreciable control of stem rust was given by one application of kolo dust, there was a slight increase of yield and weight as well as an improvement in grain quality in the treated plots.

The upper limit for the length of time that should elapse between successive applications of sulphur was found to be 9 days. Dusting with 60 lb. sulphur per acre, even during the flowering period, had no injurious effect.

No control of stem rust or increase of yield were obtained in Marquis wheat at St. Paul, or in Mindum at Crookston, by the application of kolo dust broadcast to the soil between the rows at flowering time in amounts ranging from 30 to 1,920 lb. per acre.

At Crookston, Ruby wheat plants dusted 7 times with kolo at the 60 lb. rate at 5-day intervals yielded 26·7 per cent. more wheat than the untreated controls. This increase in yield, as well as an augmentation of weight per bushel and an improvement in grade, was attributed to the marked decline of leaf rust, since there was very little stem rust in these plots. There was a slight decrease in the protein content of the dusted plants as compared with the untreated ones (14·80 and 15·16 per cent., respectively).

HANNA (W. F.). **Studies on the nature of rust resistance in Wheat. V. Physiology of the host.**—*Canadian Journ. of Res.*, iv, 2, pp. 134–147, 1931.

Details are given of the author's investigation, in connexion with studies at Edmonton, Alberta, of the nature of resistance of wheat to stem rust (*Puccinia graminis tritici*) [*R.A.M.*, ix, pp. 95, 96], of the importance of host vigour as a factor in determining the varietal resistance in wheats to this rust. The work consisted in the determination of catalase, diastase, and oxidase activity, rate of respiration, and content of chlorophyll, xanthophyll, and carotin in the leaves of the eight wheat varieties enumerated in the previous papers of this series [loc. cit.], ranging in their reaction to the rust from almost complete susceptibility to high resistance. The results so far obtained indicate that in all the varieties tested catalase activity increases as the plants approach maturity, while diastase activity is slowed down with increasing age. No significant differences were found in the oxidase activity or rate of respiration of the varieties. Little Club and the varieties belonging to the *vulgare* group were shown to be relatively rich in chlorophyll and the carotinoids, suggesting that photosynthetic processes may take place more rapidly in the tissues of the varieties rich in these pigments and thus provide conditions suitable for the development of the rust mycelium.

Lobik (V. I.). Влияние опыливания серой и опрыскивания раствором мышьяковисто-кислого натра на урожай Пшеницы. [Effect of sulphur dusting and of spraying with sodium arsenate solution on the yield of Wheat.]—*Bull. North Caucasian Plant Prot. Stat. 1930*, Rostoff-on-Don, 6–7, pp. 163–164, 1930. [German summary. Received June, 1931.]

Field experiments in 1929 at the Essentuki [North Caucasus] Plant Protection Station showed that applications of a sodium arsenate spray (20 gm. sodium arsenate, 40 gm. unslaked lime, 12·3 l. water) to wheat considerably reduced the yield of grain. Sulphur dusting, on the other hand, did not appreciably affect the yield. The experiments were primarily planned to test the controlling effect of these substances on wheat rust [*Puccinia* spp.], but no definite conclusions as to this were reached, owing to the slight incidence of rust in 1929.

Treschow (A.). **Berberis och svartrost.** [Barberry and black rust.]—*Tidskr. för Landtmän*, xiv, 16, pp. 315–316, 1 graph, 1931.

In the province of Södermanland (Sweden) the sum of Kr. 30 000 has been set aside for the administration of the barberry eradication campaign which, it is hoped, will lead to the eventual extermination of black rust of cereals [*Puccinia graminis*: *R.A.M.*, ix, p. 705; x, p. 1]. In Västmanland the sum of Kr. 20,000 is available for the same purpose. Maps have been prepared showing the distribution of the bushes, which are to be sprayed with sodium chlorate. The cost of the work is estimated at Kr. 5 per hect.

Vilkaitis (V.). **Ar kūleti Kviečiai esti labiau nurūdiję?** [Is bunted Wheat less resistant to yellow rust?]—Pamphlet issued by *Akc. 'Spindulio' Spaustuve*, Kaunas [Kovno], 10 pp., 2 graphs, 1931. [German summary.]

The author states that observations in 1929 in Lithuania on plots of seven named varieties of wheat of the *vulgare* group, which had been experimentally infected with bunt [*Tilletia caries*], showed that the leaves on stalks bearing bunted ears were the most severely attacked by yellow rust (*Puccinia glumarum*), and those of plants free from bunt were the least, while leaves on stalks free from bunt but belonging to bunted stools occupied an intermediate position. These facts tend to confirm the view previously advanced that bunt predisposes the wheat plant to attacks of yellow rust [*R.A.M.*, x, p. 373.]

Obermeister (N. P.). Головня на Кубани, ее распостранение, степень зараженности и видовой состав по данным обследования **1929** года. [Smut in the Kuban, its distribution, degree of infection, and species involved, according to observational data in 1929.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 155–162, 1930. [German summary. Received June, 1931.]

In giving brief notes, based on field observations, on the distribution and severity in 1929 of the chief cereal smuts, namely,

bunt of wheat (almost exclusively *Tilletia levis* [*T. foetens*]), smut of oats [*Ustilago avenae*]. covered and loose smuts of barley [*U. hordei* and *U. nuda*], and maize smut (*U. maydis*) [*U. zeae*], rarely *U. reiliana* [*Sorosporium reilianum*], in the Kuban province of North Caucasus, the author states that the striking feature of the investigation was the very considerable reduction noticed in the prevalence of these diseases, as compared with former years [*R.A.M.*, vii, pp. 772, 773]. This improvement in the health of the crops is attributed mainly to the strict administrative measures taken to enforce the compulsory disinfection of seed-grains, most of which is done by means of formalin [cf. ibid., vii, p. 500]. In some localities these measures have led to the practical suppression of wheat bunt.

LOBIK (A. I.). К вопросу о значении зерноочистительных машин в распространении твердой головни Пшеницы. [On the question of the part played by grain-winnowing machines in the distribution of bunt of Wheat.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 185–194, 1930. [German summary. Received June, 1931.]

The examination in 1929 in North Caucasus of 1,524 duplicate samples of cereal grain, taken from as many lots before and after passing through winnowing machines, showed that in about one-quarter of the cases previously clean grain came out of the machines infected with smut spores or the spore load of the grain was increased from 1 to 39-fold; in over one-third of the cases the spore load was not affected by the treatment, and a reduction of the spore load was observed in less than one-fifth of the samples. The increase in the spore load of the grain was independent of the type of winnowing machines used. These observations demonstrate the danger of the indiscriminate winnowing of grain as practised at the present time in the region, inasmuch as it undoubtedly serves to propagate cereal smuts, particularly wheat bunt [*Tilletia foetens*: see preceding abstract].

BRESSMAN (E. N.). **Rye infected with bunt of Wheat.**—*Phytopath.*, xxi, 4, pp. 437–440, 2 figs., 1931.

Of the 31 collections of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] obtained from the Hybrid 128 variety at Corvallis, Oregon, and used to inoculate Oregon rye selection and Rosen rye procured from Michigan, only one (physiologic form 9) of *T. caries* [which the author states will be described in a subsequent publication] produced infection on rye (6·1 per cent. on the former and 3·5 per cent. on the latter variety). The collection in question originated in Morrow County, Oregon, an important wheat-growing section, and is one of the most virulent strains on wheat obtained by the writer. In duplicate material from Pendleton, Oregon, where 20 bunt collections were used on the above-mentioned varieties, both species caused infection (133 out of 6,000 heads of the two varieties), but here again physiologic form 9 of *T. caries* was the most virulent. The bunt on rye at Corvallis had the typical odour of wheat bunt, and the spore dimensions also agreed with those of *T. caries* (19 μ in diameter).

Studies are in progress to determine whether or not *T. secalis* is a form of *T. caries* [*R.A.M.*, iii, pp. 30, 328 and next abstract].

LOBIK (V. I.). О нахождении мокрой головни. **Tilletia foetens (Berk. et Curt.) Trel.** на Ржи (**Secale cereale L.**). [On the occurrence of bunt *Tilletia foetens* (Berk. et Curt.) Trel. on Rye (*Secale cereale*).]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 165–166, 1930. [German summary. Received June, 1931.]

The author states that in 1928 rye growing on the grounds of the Essentuki [North Caucasus] Experimental Station as an admixture in wheat which had been experimentally infected with bunt (*Tilletia foetens*) was found to be attacked by this fungus. The spores on rye, however, were for the most part spherical like those of *T. tritici* [*T. caries*: *R.A.M.*, x, p. 372 and preceding abstract], while on wheat they were typically ellipsoidal. The spores collected from rye were shown to be able to reproduce the original disease in wheat in 1929, when wheat seed-grain was artificially contaminated with them.

PETRI (L.). **L'azione stimolante e disinfettante dei trattamenti dei semi di Grano eseguiti con sali di mercurio.** [The stimulating and disinfecting action of seed treatments of Wheat with mercury salts.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 3, pp. 326–329, 1930.

After referring to recent investigations into the treatment of cereal seed with mercury salts the author quotes from a report wherein Mencacci describes an experiment in which wheat was grown from healthy seed of the Ardito variety and from seed of the same variety inoculated with *Tilletia tritici* [*T. caries*], one plot of each being sown with untreated seed and one with seed dusted with 2 per mille abavit B. The plants from both plots of healthy seed remained free from infection, but whereas the untreated inoculated seed gave 8·71 per cent. infection, the corresponding figure for the treated inoculated seed was only 0·3 per cent. The increase in yield that resulted from the treatment was equivalent in the case of the healthy seed to over 2·5 quintals per hect. and in that of the inoculated seed to over 3·4 quintals per hect.

PETRI (L.). **Un'estesa infezione di Pythium su piante di Grano.** [An extensive infection of *Pythium* on Wheat.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 3, pp. 285–301, 10 figs., 1930.

In 1930 most of the wheat throughout the province of Padua developed dark, later straw-coloured, elongated, necrotic lesions which were present in the middle of the first basal internode of the late varieties and in the middle of the second basal internode of the early ones, these internodes showing at the same time the characteristic zonation of bands of paler and normal green colour due to the effect of late cold aggravated by persistent rain. That the development of the necrotic lesions depended on this condition of the internode was further indicated by the fact that only wheats sown as late as November and December remained unaffected. The localization of the lesions some distance above

the soil suggested that the causal organism was not part of the usual wheat microflora but a new parasitic form. The infected areas of the stems invariably contained the mycelium of a species of *Pythium*, while occasionally *Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, and *Fusarium culmorum* were also present. In general, late varieties sustained the most damage.

In culture on carrot agar the *Pythium* mycelium formed a snow-white, superficial, cottony layer of bundles of regularly branched, aerial hyphae showing false dichotomy, often undulating at the extremity, occasionally thickened at the point of branching, and measuring 2 to 5·5 μ in diameter. The very numerous, apical or intercalary oogonia measured 21 to 26 μ in diameter and were fertilized by a single antheridium formed by a branch of the hypha which gave rise to the oogonium. Occasionally the terminal portion of the antheridium was separated from the base by a septum. The smooth oospores, which completely filled the oogonium, measured 16 to 24 μ in diameter: they were not observed to germinate. Numerous intercalary, irregularly swollen organs of reserve ('presporangia') [*R.A.M.*, viii, p. 740] were often found on the mycelium.

Attempts to secure true sporangia were unsuccessful, only vegetative hyphae being produced. The formation of sexual organs was greatly favoured by the presence of organic nitrogen in the culture medium.

From the slenderness of the hyphae and the characters of the reproductive organs the fungus is considered to be referable to the *P. gracile* group [cf. ibid., ix, p. 175] but not to *P. butleri* or species near it, such as that described by Carpenter on sugar-cane in Hawaii [ibid., viii, p. 739].

LOBIK (V. I.). Зараженность сортовых Овсов пыльной головней **Ustilago avenae (Pers.) Jens.** на Тереке по наблюдениям за **1927, 1928, и 1929** г.г. [The degree of infection of Oat varieties with smut *Ustilago avenae* (Pers.) Jens. in the Terek region according to observations in 1927, 1928, and 1929.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6-7, pp. 167–168, 1930. [German summary. Received June, 1931.]

None of the 23 named varieties of oats which were tested from 1927 to 1929 at the Essentuki [North Caucasus] Experimental Station was entirely free from smut (*Ustilago avenae*), with the exception of a new variety (Moskowski 0315) which was first introduced in 1929 and was apparently immune from the disease. Banner oats showed only 0·43 per cent. infection in that year, and the infection of Pflug and Leitewitztki varied over the three years from 1·4 to 3·9 and 0·5 to 2·6 per cent., respectively. All the other varieties showed a much higher degree of susceptibility.

HINO (I.). **The behaviour of the Citrus canker organism in the soil and in water.**—*Studia Citrologica, Tanaka Citrus Exper. Stat.*, iv, 2, pp. 167–178, 1 pl., 1931. [Japanese, with English summary.]

An experiment in which garden soil and pond water were inocu-

lated with *Bacterium* [*Pseudomonas*] *citri* [*R.A.M.*, x, p. 97] showed that the organism can remain viable in these situations for several months. Some degree of antagonism was found to exist between *P. citri* and a number of other bacteria [which are enumerated], but this was insufficient to inhibit the development of the canker organism. It is evident, therefore, that *P. citri* may overwinter in the soil in Japan. Infested water also constitutes a source of fresh contamination, though not such an important one as the soil. *P. citri* was found to thrive in relatively dry soils with a highly alkaline reaction. During the winter months, moreover, the soil protozoa are not as active in the extermination of the canker organisms as in the warmer weather.

PETRI (L.). **I risultati di alcune ricerche sperimentali sopra il 'mal secco' degli Agrumi.** [The results of experimental researches on 'mal secco' disease of Citrus.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 3, pp. 353–359, 1930.

When hanging drop cultures of the mycelium of *Deuterophoma tracheiphila* [*R.A.M.*, x, pp. 181, 182] were grown in the boiled and unboiled, filtered juice expressed from one- and two-year old orange and lemon twigs, the mycelium developed in all four tests, but growth was most rapid and abundant in the juices from lemon, particularly after boiling. When the conidia of the fungus were used, similar results were obtained, except that there was less difference in the length of the germ-tube in the boiled and unboiled lemon extract.

It is concluded that both in the orange and lemon twig juices one or more thermolabile substances exist which impede the growth of the fungus and that the juice from the orange twigs contains, in addition, one or more thermostable substances which exercise a similar effect.

In June, 1930, two young *Poncirus trifoliata* trees growing in the open at Messina were inoculated with the mycelium of *D. tracheiphila*; by the end of September the mycelium had invaded a small part of the woody tissue but no external withering was apparent. That this slow progress of the disease was due to the prevailing high summer temperature and not to the resistance of the host was indicated by the fact that other *P. trifoliata* trees in the same field became naturally infected in September. In one plant infection had occurred simultaneously in several different parts; the bark of the trunk had dried up and the wood showed reddish areas separated by healthy portions. Careful examination established that infection had not originally taken place through the roots.

Investigations into the effect of seasonal temperature upon *D. tracheiphila* [cf. ibid., x, p. 184] showed that the mycelium present on the branches stops growing in summer but remains alive, while nearly all the pycnospores formed during spring lose their germinative power during summer, the ratio of those which can be germinated to those which cannot being calculated as 1 to 100,000. This accounts for the rarity of new infections in the early autumn as compared with those found in March and

throughout the spring, and demonstrates indirectly the necessity for removing and destroying infected branches.

To ascertain whether, as is commonly alleged in Italy, applications to the trees of stable manure provoke severe attacks of the disease, a number of lemon trees were so manured in winter and others in spring, but none developed any symptoms of serious wilt. In all probability the rapid development of mal secco in association with stable manuring was due to infection of the roots following mechanical injuries inflicted by the implements used and to the fact that the manure contained leaves taken from beneath infected trees.

COOK (M. T.). **La roña de la Toronja en Puerto Rico.** [Scab of grapefruit in Porto Rico.]—*Puerto Rico Dept. Agric. y Trab. Estac. Exper. Insul. Circ.* 92, 15 pp., 3 figs., 1931.

Popular notes are given on the symptoms and control of scab of grapefruit (*Sphaceloma fawcettii* or *Sporotrichum citri*) [*R.A.M.*, x, pp. 24, 98] under Porto Rico conditions. The application of 3–3–50 Bordeaux mixture every 10 to 15 days during rainy periods acts as a satisfactory preventive measure. The Triumph variety is resistant to scab, but has not proved acceptable to the American market.

TORRES (I. L.). **Bud rot of Coco-nuts in Porto Rico.**—*Plant Disease Reporter*, xv, 3, pp. 23–24, 1921. [Mimeographed.]

Notwithstanding all attempts at eradication made during the last five years by the Bureau of Agricultural Development, bud rot of coco-nuts (*Phytophthora faberi*) [*P. palmivora*] continues to cause heavy damage in Porto Rico [*R.A.M.*, ix, p. 304]. So far, the most effective method found for arresting the spread of the fungus is the destruction by fire of all diseased palms. Since the inception of the eradication campaign the bud rot organism has killed (up to 30th June, 1930) 6,897 coco-nut palms and 858 hat palms (*Sabal causiarum*). The agent in charge of the work reports that 229 farms have been inspected, on which 3,381 coco-nut and 242 hat palms were destroyed. Of the 9,776 palms (5,071 coco-nuts and 4,705 *S. causiarum*) found to be infected in the survey made from July to December, 1930, 4,133 were destroyed during the period in question. The inspection and eradication work will be continued until entire control of the disease has been obtained.

Reports received from Experiment Stations, 1929–1930.—342 pp., 1 pl., 47 graphs, 12 diags., London, Empire Cotton Growing Corporation, 1931.

In this compilation [which is on the same lines as in previous years: *R.A.M.*, ix, p. 590] of the reports for the season 1929–1930 sent in by various cotton-growing stations of the British Empire, the following references may be mentioned.

The low yield of cotton experienced in that year in the Gezira irrigated tract of the Sudan is attributed to widespread water-logging, consequent on the abnormally heavy rains during and after the planting season. Apart from creating soil conditions

specially unfavourable to root growth and predisposing the cotton plants to attacks of the blackarm disease [*Bacterium malvacearum*: ibid., x, p. 26], waterlogging prolonged the average sowing time and exposed the plants to conditions favouring the maximum development of leaf curl symptoms [ibid., x, p. 188]. This disease was general throughout the area and played a very important part in the reduction of the yield, being practically universally present on all late resowings, on which it developed right from the start. Plants which survived from early sowings developed the disease at a late stage and were able to produce a reasonably well-developed zone of fruiting branches before the leaf curl region was reached. Blackarm was serious in the early stages of the development of the plants and caused a loss of early crop, but probably not much more than in most other years.

Certain pure or relatively pure strains of Sea Island cottons exhibited markedly greater resistance to leaf curl than any of the surrounding types of Sakel when grown in the Gezira. One strain, in particular, was reported to have remained entirely free from the disease, though surrounded on all sides by other plants showing the characteristic symptoms. The observations appeared to suggest that the development of leaf curl (as apart from its transmission) depends in some way on soil conditions, and that the strong rooting habit of the Sea Island cotton enables it to make use of the Gezira soil to a better advantage than the Sakel types. In variety tests, the variety Shambur Sakel I was found to show considerable resistance to blackarm as well as leaf curl, and the American cotton Parnell's U. 4 showed indications of being one of the most resistant types to leaf curl. The latter, which is a selection made in South Africa from a strain of American type obtained from Uganda, was also tried for the first time in Uganda, where it was found to be a heavy cropper on poor soils, resistant to drought and to attacks by jassids, and also resistant to blackarm.

A survey of the crop conditions in the Eastern Province of Uganda showed a considerable reduction in the yield of seed and of lint, amounting to a drop of up to 40 per cent. as compared with normal years, the cause being probably a combination of bad weather and blackarm attacks. In the Mengo and Entebbe districts, on the other hand, the general condition of the crop was much better, and although blackarm was present, it did not cause much loss of crop, except in the dry area in north Bulemezi.

COUCH (J. N.). **The biological relationship between Septobasidium retiforme (B. & C.) Pat. and Aspidiotus osborni New. and Ckll.**—*Quart. Journ. Microscop. Sci.*, lxxiv, 3, pp. 383–437, 5 pl., 59 figs., 1931.

An account is given of the association of *Septobasidium retiforme* [*R.A.M.*, viii, p. 642] with the scale insect *Aspidiotus osborni*. The relationship is believed to be of a symbiotic nature.

FUJII (S.). **Über die durch neu entdeckte Dermatophyten hervorgerufene Trichophytie der Haut, sowie über Trichophytien und Trichophyten in Shikoku.** [On the trichophytosis of the

skin caused by newly discovered dermatophytes, and on trichophytoses and trichophytes in Shikoku.]—*Japanese Journ. of Dermatology*, xxxi, 3, pp. 305–357, 2 pl. (1 col.), 46 figs., 4 graphs, 1931. [German summary on pp. 11–14.]

During the period from the middle of July to the middle of August, 1929, the author examined the pupils of 31 national schools on the island of Shikoku, Japan, for the occurrence of trichophytoses. The total number of cases found was 381 (2·91 per cent. among the boys and 0·74 per cent. among the girls), and 134 strains of the following fungi were isolated: *Bodinia violacea* [*Trichophyton violaceum*], *B. glabra* [*T. glabrum*: *R.A.M.*, x, p. 458], *Sabouraudites ruber* [*T. rubrum*], *Grubyella ferruginea* [*Microsporon ferrugineum*: ibid., x, p. 243], *T. coccineum*, *S. asteroides* [*T. mentagrophytes*: loc. cit.], and two new species, *T. kagawaense* and *T. ehimeense*. *M. ferrugineum* was responsible for the largest number of cases.

T. kagawaense was isolated from the right hand of a girl affected by a condition resembling eczema marginatum. The undulating hyphae measure 4·8 μ in width and the numerous lateral spores 4·5 to 5·5 μ in diameter. Intercalary chlamydospores, measuring up to 8 or 10 μ diameter, are formed in profusion, while corkscrew spirals (Sabouraud's 'vrilles') were also observed. Inoculation experiments on laboratory animals and on human patients gave positive results. The distinctive characters of the colonies on Sabouraud's maltose agar and peptone agar are briefly described.

T. ehimeense, isolated from an eruption on the parietal region of a boy, is characterized by hyphae measuring 4 μ in width, spores 3 μ in diameter, and numerous intercalary chlamydospores, spindles, and 'vrilles'. The diameter of the chlamydospores was about 9 μ and the unilocular (rarely bilocular) spindles measured 13 by 4 μ. Positive results were given by inoculation tests on animals and human patients.

GOODMAN (H.). **Tinea the second most prevalent disease of the skin.**—*Arch. of Dermatology*, xxiii, 5, pp. 872–873, 1931.

Ringworm infection of the skin appears to have been increasing in prevalence in the United States of recent years. An examination of the statistics published by the New York Skin and Cancer Hospital shows that the number of cases of tinea in 1929 was 2,935 as compared with 839 in 1925. During the period from 1913 to 1927, inclusive, tinea was eighth or ninth in order of occurrence of the common skin diseases. In 1928 and 1929 routine examinations disclosed some clinical phase of epidermophytosis (ringworm of the toes) in approximately half the persons of post-adolescent age in the schools and colleges of the United States.

VILKAITIS (V.). **Linų antraknozas (Colletotrichum lini (Westerdijk) Tochinai).** [Flax anthracnose (*Colletotrichum lini* (Westerdijk) Tochinai).]—Reprinted from *Žemės Ūkis* (*Die Landwirtschaft*), 4, 10 pp., 5 figs., 1931. [Lithuanian with German summary.]

The examination of samples of flax seed from various parts of

Lithuania showed that *Colletotrichum lini* [*R.A.M.*, x, p. 459] is present in twelve districts.

Laboratory inoculation experiments, in which spore suspensions of the fungus were applied to the cotyledonary leaves, showed that the appressoria produced by the conidia give rise to infection hyphae that penetrate the leaf directly through the epidermal wall. The epidermal walls immediately below the appressoria disintegrate and the central portion turns brown. Infection hyphae were detected in the leaf tissues on the second day after inoculation. The typical anthracnose spots appeared on the leaves on the fourth day; later they expanded, became confluent, and the leaf shrivelled and wilted. Incipient conidial formation was observed in the laboratory towards the end of the first week; on seedlings kept under bell-jars spore production was much more profuse.

Naturally infected seeds, dried for one hour at 36° to 42° C., became covered with the mycelium of the fungus on being laid out for germination. The germinability of the seed was not reduced by dusting with ceresan or by treatment with germisan (short disinfection process).

KONOPACKA (WANDA). **O chorobie Lnu, spowodowanej przez grzyb pasorzytnici Polyspora lini Lafferty.** [On the disease of Flax caused by the parasitic fungus *Polyspora lini* Lafferty.]—*Choroby Roślin* [*Plant diseases*], Warsaw, i, 2, 4 pp., 1931. [English summary.]

A brief account is given of an outbreak in 1930 of *Polyspora lini* on the Wołożyński variety of flax in the Experimental fields of the Chief School of Agriculture at Skierniewice, near Warsaw, this being stated to be the first record of the fungus from Poland. The disease only attacked two plots of flax that had been sown late in the season and grew under exceptionally wet conditions. It only caused browning of the stems, no stem-break having been observed. The organism agreed well in its morphological characters with Lafferty's description [*R.A.M.*, ii, p. 116]. The control measures recommended are based on the work done in this regard in Ireland [loc. cit.].

SMITH (G.). **The identification of fungi causing mildew in cotton goods: the genus Aspergillus—part II.**—*Journ. Text. Inst.*, xxii, 2, pp. T 110–T 116, 4 pl., 1931.

In this paper the author gives a morphological and taxonomic account of some forms of *Aspergillus* which had not been included in his previous communication [*R.A.M.*, vii, p. 580] on the species of this genus isolated from cotton goods, and also of a number of forms sent to him by Galloway [ibid., ix, p. 784]. All these organisms were found to be distributable into two groups, namely, the *A. glaucus* series, and a group intermediate between *A. glaucus* and *A. fumigatus*, which it is proposed to designate the *A. penicilloides* series, since it includes *A. penicilloides* Spegazzini. The former series includes *A. repens*, *A. ruber*, *A. amstelodami*, Form S. 78 (probably belonging to *A. herbariorum* ser. *minor* of Mangin), and *A. chevalieri*. The second series comprises *A*

gracilis, *A. penicilloides*, *A. restrictus* n. sp., and *A. restrictus* var. *B*. English diagnoses are given of the new species and its variety.

BURGESS (R.). **Factors affecting the development of mildew on wool.**—*Journ. Soc. Dyers & Colourists*, xlvii, 4, pp. 96–98, 1931.

A brief survey is given of the factors promoting the development of mildew in wool [caused chiefly by *Aspergillus niger*, *A. fumigatus*, *Trichothecium roseum*, and *Penicillium brevicaule*: *R.A.M.*, x, p. 244], with special reference to a high moisture regain (24 per cent.) and the action of the higher fatty acids, hygroscopic soaps, vegetable oils, water-soluble substances, and strong acids, all of which favour the growth of the organisms concerned.

Very satisfactory results in the prevention of mildew have recently been obtained by chroming, and investigations are in progress at the Shirley Institute on the effect of the addition of antiseptics to size mixings. The most effective of these substances, viz., shirlan, is now being successfully applied to cotton goods destined for export and storage abroad. Out of some 150 substances tested for their inhibitory action on the fungi responsible for mildew in wool, only a few combine this property with suitability for commercial application. These are sodium fluoride, sodium silicofluoride, and shirlan N.A.; β naphthol at first appeared to be satisfactory but had to be discarded on account of undesirable odours and staining in the event of mildew development.

In the course of the discussion on this paper (pp. 98–99), it was stated that the moth-proofer eulan W extra is also efficacious against mildew.

Some general directions are given for the avoidance of mildew during storage by adequate ventilation and other sanitary precautions.

DRAYTON (F. L.). **The yellow disease of Hyacinths, Pseudomonas hyacinthi (Wakker) E. F. S.**—*Canada Dept. of Agric. Pamphlet* 104, N.S., 6 pp., 1 pl., 1929. [Received March, 1931.]

During a recent visit to Holland the writer obtained valuable information relating to the control of yellow rot of hyacinths (*Pseudomonas hyacinthi*) [*R.A.M.*, x, p. 386].

Specially trained men are employed by growers for the systematic inspection of the fields during the period of active growth of the plants. When affected plants are found, they are immediately covered with a flower pot and a 10 per cent. solution of carbolineum or 5 per cent. formaldehyde is sprayed on the foliage of the surrounding plants within a radius of 4 or 5 ft. The bulbs of the diseased plants are left in the ground until the sound ones have been dug, after which they are removed and burnt. When a number of diseased plants are found in one part of the field, the affected area is enclosed with sheets of an asbestos material called 'eterniet', supported by stakes driven into the ground. This measure has been found effective in checking the spread of infection. Inspectors employed by the Hyacinth Association survey

all the fields for disease and keep a record of every variety cultivated by each grower, with notes on the presence or absence of infection. A duplicate of this record is issued to the grower and constitutes a certificate of health, without which no public or private sale of hyacinth bulbs is permissible.

P. hyacinthi may be transmitted from diseased to healthy bulbs by means of the knife used for 'scoring' or 'scooping', two methods of propagation of which the former consists in two or three cross cuts through the basal plate of the bulb, while in the latter the entire basal plate tissue is scooped out.

A brief note is given on the hot air and hot water heating systems with which the storehouses are equipped, whereby the temperature is maintained at 99° to 100° F. during September and gradually reduced to between 80° and 85° in October, after which heating is discontinued in order to accustom the bulbs to the outdoor temperatures prevailing in November, when they are usually planted out.

This paper also contains information on the symptoms and mode of spread of yellow rot, and on varietal susceptibility to the disease.

McKENNY HUGHES (A. W.). **Aphides as vectors of 'breaking' in Tulips.**—*Ann. of Appl. Biol.*, xviii, 1, pp. 16–29, 1 pl., 1931.

A description is given of experiments in 1930, in continuation of the author's study of the part played by insects in the transmission of the 'breaking' disease in tulips [*R.A.M.*, ix, p. 528], the results of which definitely showed that the virus in nature is distributed by *Myzus persicae*, and to a lesser extent by *Macrosiphum gei*. Two types of 'break' were distinguished during the work, namely, 'red break' (in which deeper red streaks occur on the red ground colour), and 'white break' (in which streaks and stripes of white occur), and there was some evidence that the former is an earlier stage in the development of the virus, and the latter the final stage; both types were equally transmitted by the two species of aphids. Preliminary experiments indicated that the condition known as 'parrot' (characterized by curled and laciniated petals with inclusions of green tissue) [ibid., vii, p. 724] is not transmissible by the insects, but this needs further proof. Some indication was also obtained of variations in the degree of virulence of the virus in different varieties of tulips, since it was much more readily transmitted from the 'Sulphur' than from the 'Bartigon' varieties. Mass infection in the open gave a lower percentage of 'break' than individual infection under glasshouse conditions.

CHESTER (K. S.). **Graft-blight: a disease of Lilac related to the employment of certain understocks in propagation.**—*Journ. Arnold Arboretum*, xii, 2, pp. 79–146, 4 pl., 6 graphs, 1931.

Some of the information in this paper has already been summarized [*R.A.M.*, x, p. 190], but the following point is of interest. With a view to ascertaining the cause of graft-incompatibility in the lilac, a precipitin technique [full details of which are given] was applied to the lilac-privet graft. The filtered plant extracts

to be tested were carefully pipetted into narrow test tubes so that the extract of lesser specific gravity formed a layer above that of greater specific gravity. The precipitin reaction, when present, appeared as a cloudy ring at the junction of the two liquids. A total absence of normal precipitins was found in the Oleaceae. Graft-blighted plants exhibited a high precipitin potency between the extracts of stock and scion which was, however, non-specific, as it was given when other plants than privet were used as stocks. Although no definite conclusions can be drawn from these results at the present stage, they are considered to be of some importance in focussing attention on the state of health of the tissues involved, and on the development of the precipitin reaction as related to morbidity of the plant cell.

ULBRICH (E.). **Über eigenartige alloiophylle Riesenformen von Anemone nemorosa L. mit Urocystis-Befall.** [On peculiar alloiophyllous giant forms of *Anemone nemorosa* L. with *Urocystis* infection.]—*Notizbl. Bot. Gartens und Museums zu Berlin-Dahlem*, xi, 102, pp. 128-134, 1931.

In June, 1927, the writer received from the vicinity of Lübeck some specimens of *Anemone nemorosa* characterized by the abnormally large size of the vegetative organs and especially of the flowers, which attained a diameter of up to 70 mm. On examination the plants were found to be infected by *Urocystis anemones* [*R.A.M.*, ix, p. 737], which occurred at the base of an involucral leaf, causing extensive swelling of the petiole. Most of the spore balls consist of 1 to 3 spores, but in some 4 were observed. Each spore is accompanied by 1 to 2, or occasionally up to 4 or more accessory cells. The spores are somewhat paler than in the usual forms of *U. anemones*; they are dark brown, subspherical, smooth, 12 to 18 μ in length and 10 to 16 μ in thickness, while the accessory cells are somewhat shorter and scarcely half as thick as the spores, pale, with thick yellow walls, and measure 4 to 10 by 3 to 8 μ. In the flower of one of the infected plants, which measured about 50 mm. in diameter, the anthers were somewhat smaller than the normal, with relatively few sulphur-yellow, immature pollen grains, and the carpels were atrophied into elongated-oval to sublineal structures with crooked styles and abortive ovules. In May, 1928, fresh rhizomes of *A. nemorosa* were obtained from the affected locality, but only two abnormal plants developed, one in 1929 and the other in 1930; in the former a basal leaf (absent in the original material) showed the same abnormal expansion of the lamina as the involucral leaves. The diseased plants did not flower and the fungus formed no spores. There was no external difference between the rhizomes of healthy and diseased plants.

Attention is drawn to some striking resemblances between the hypertrophied plants of *A. nemorosa* from Lübeck and those described by Klebahn as suffering from alloiophylly [ibid., vii, p. 797], but no conclusion as to the possibility of a connexion between this phenomenon and the smut can be reached on the basis of such scanty material.

Discussing the taxonomy of the genus *Urocystis*, the writer upholds Liro's subdivision of the collective species *U. anemones*

into a number of species each restricted to certain hosts (*Ann. Univ. Fenn. Aboënsis*, Ser. A, i, 1922).

McClintock (J. A.). **Cross-inoculation experiments with Erigeron yellows and Peach rosette.**—*Phytopath.*, xxi, 4, pp. 373–386, 3 figs., 1931.

Erigeron canadensis, a common weed in waste lands and abandoned fields throughout Tennessee, is liable to infection by aster yellows [*R.A.M.*, x, p. 82], the symptoms of which are strikingly similar to those of peach rosette [ibid., ix, p. 436]. Hundreds of *E. canadensis* plants raised from seed collected from yellows-infected plants showed no symptoms of the disease, which does not appear, therefore, to be transmissible by the seed. Numerous unidentified beetles and grasshoppers, as well as the tarnished plant bug (*Lygus pratensis*), the potato flea-beetle (*Epitrix cucumeris*), the 12-spotted cucumber beetle (*Diabrotica duodecimpunctata*), the leafhoppers *Empoasca mali*, *E. flavescens*, and *Cicadula sexnotata*, and the aphids *Rhopalosiphum persicae* and *Macrosiphum solanifolii* [*M. gei*], when transferred with yellows-infected plants of *E. canadensis* and caged on healthy peach trees, failed to transmit any symptoms of disease to the latter.

More than one hundred mechanical inoculations into peach shoots and green fruits, made with a hypodermic needle and fresh undiluted extract from yellows-infected *E. canadensis* plants, gave entirely negative results, as did also the attempts to infect *E. canadensis* by leaf mutilation and sap inoculations from rosetted sand cherries (*Prunus pumila*). Budding experiments from sand cherry and plum to *E. canadensis* also failed, no union taking place between the tissues.

Rosette was found to be readily transmissible from plum to peach and sand cherry by infected buds. The latter is stated to be a new host for the disease. Bud transmission of the disease from sand cherries to plums was uniformly successful.

The results of these cross-inoculation experiments are considered to indicate that yellows of *E. canadensis* is a disease distinct from rosette of peach, plum, and sand cherry.

Ulbrich (E.). **Über den Hexenbesenrost der Berberitze, Puccinia arrhenatheri (Kleb.) Erikss. (Aecidium graveolens Shuttl.).** [On the witches' broom rust of the Barberry, *Puccinia arrhenatheri* (Kleb.) Erikss. (*Aecidium graveolens* Shuttl.).]—*Notizbl. Bot. Gartens und Museums zu Berlin-Dahlem*, xi, 102, pp. 124–128, 1931.

In May, 1926, the writer observed extensive infection by aecidia of the witches' broom rust (*Puccinia arrhenatheri*) on barberry (*Berberis vulgaris*) bushes in the Rüdersdorf-Kalkberge district of the Mark Brandenburg, where it had not been reported since 1892. The aecidia of the rust (the uredo- and teleutospores of which occur on *Arrhenatherum elatius*) were found again in 1927 and 1928, but not during 1929 or 1930. By 1927 a number of the more severely infected bushes were already partially dead, while others were much stunted. According to the statements of several

authorities consulted by the writer, *P. arrhenatheri* has not been observed in Germany during the last few decades.

In all the specimens examined the aecidia were confined to the leaves of the short shoots. Severely infected leaves are much deformed and fall prematurely. The aecidia mostly occur in dense clusters on the under side of the leaf but are sometimes found singly. They are much smaller than those of *P. graminis* and are almost tubular.

A list is given of the localities in which the rust has hitherto been recorded in Germany and elsewhere in Europe, North Africa, Syria, and Turkestan.

WIANT (J. S.). **Bacterial wilt of Alfalfa.**—*Wyoming Agric. Exper. Stat. Bull.* 177, 20 pp., 10 figs., 1931.

This is an expanded account of the survey made during 1930 of the lucerne fields of Wyoming to determine the nature and cause of the recent serious losses in this crop. The salient points relating to the primary source of the damage, viz., bacterial wilt (*Aplanobacter insidiosum*), have already been noticed from another source [*R.A.M.*, x, p. 464].

DIPPENAAR (B. J.). **Drie siektes wat in Suid-Afrika op Lupienplante voorkom.** [Three diseases occurring on Lupin plants in South Africa.]—*Ann. Univ. Stellenbosch*, Ser. B, ix, 1, pp. 3-10, 3 pl., 1931.

Blue lupins (*Lupinus angustifolius*) in South Africa are liable to infection by *Sclerotinia sclerotiorum* [*R.A.M.*, vii, pp. 708, 731], *Botrytis cinerea*, and *Ascochyta* sp. The last-named, a weak parasite, produces brown, sunken spots on the stems, lateral branches, and petioles. Owing to the development of numerous dark-brown, ostiolate, spherical pycnidia, measuring 77 to 132 μ in diameter, the lesions assume a rough, speckled appearance; subsequently the infected tissues disintegrate and the dead areas become bleached. The oblong, hyaline, uniseptate conidia, rounded at the ends, measure 24 to 37 by 5 to 10·5 μ, and the coloured, branched hyphae 4 to 4·7 μ in thickness. The perfect stage of the fungus has not been found, and it is uncertain whether the lupin *Ascochyta* is identical with *A. pisi*, which causes fairly severe damage to peas in the Western Cape Province, and is frequently found in the perfect stage *Mycosphaerella pinodes* [ibid., x, p. 408].

EDGERTON (C. W.). **Entyloma meliloti McAlpine in Louisiana.**—*Plant Disease Reporter*, xv, 4, p. 31, 1931. [Mimeographed.]

For the past three years the smut *Entyloma meliloti* has been observed on the leaves of *Melilotus indica* in the sugar-cane fields round Baton Rouge, Louisiana, where the host is extensively used as a cover crop. H. S. Jackson, who identified the fungus, states that this is the first record for the North American mainland.

THOMAS (H. E.) & THOMAS (H. E.). **Plants affected by fire blight.**—*Phytopath.*, xxi, 4, pp. 425-435, 1931.

The results (which are tabulated and discussed) of inoculation experiments in California with the fireblight organism (*Bacillus

amylovorus) on 56 species of 11 genera of plants yielded the following information (much of which is believed to be new) in respect of susceptibility to the disease. *Cotoneaster dammeri* [var.] *radicans*, *C. horizontalis*, *C. pannosa*, and *C. salicifolia* [var.] *floccosa* are distinctly susceptible, *Pyracantha angustifolia* [*C. angustifolius*] moderately so [*R.A.M.*, x, p. 319], *C. adpressa*, *C. microphylla*, and *C. prostrata* [*C. rotundifolia*] fairly resistant, while *C. dielsianus* [var.] *elegans*, *C. acuminata*, *C. francheti*, and *C. simonsii* appear to be immune. Some plants of *C. frigida* and *C. harroviana* are markedly susceptible, while others are not, presumably on account of variation within the species. *P.* [*Crataegus*] *crenulata* and its varieties *kansuensis* and *rogersiana*, and *P. formosiana* are fairly susceptible, *P.* [*C.*] *coccinea* and its variety *lalandii* somewhat less so. A fair degree of resistance was shown by *Prunus allegheniensis*, *P. armeniaca*, *P. besseyi*, *P. cerasifera* [*P. divaricata*], and *P. simonii*. *Diospyros lotus*, *Heteromeles* [*Photinia*] *arbutifolia*, and *Raphiolepis indica* proved susceptible in inoculation tests, and fruits of *Chaenomeles* [*Pyrus*] *sinensis* grafted on quinces in a garden at Berkeley, California, were also found to be attacked by the organism.

Lobik (A. I.). Корневой рак пловых деревьев на Северном Кавказе. [Root canker of fruit trees in North Caucasus.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 243–246, 1930. [German summary. Received June, 1931.]

A preliminary investigation in 1929 revealed the existence in North Caucasus of three important infection foci of crown gall (*Bacterium tumefaciens*) of fruit trees, namely, in Bataisk, Rostoff-on-Don, and Vladikavkaz, all of which are centres for the production and distribution of nursery stock. In Vladikavkaz, especially, practically the whole of the nursery is infected, the disease having been found on young trees of apples, pears, plums, and apricots, and also on raspberry bushes and strawberry roots.

Husz (B.). **Schützt die Beize die Obstbäume gegen den Wurzelkropf?** [Does steeping protect fruit trees against crown gall?]—*Kertész. Lapok*, xliv, pp. 95–99, 1930. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 4, pp. 206–207, 1931.]

Good control of crown gall [*Bacterium tumefaciens*] on one-year-old pear trees at the Budapest Horticultural College was obtained by ten minutes' immersion of the roots before planting out in a solution of 0·5 per cent. uspulun with the admixture of a dilute loam emulsion [cf. *R.A.M.*, v, p. 494]. The treated trees showed 88 per cent. of perfect roots, whereas 68 per cent. of the controls were diseased. Encouraging results were also given by tillantin and higosan (0·25 per cent.).

Lacey (Margaret S.) & Dowson (W. J.). **Studies in bacteriosis. XVIII. A bacterial canker of Apple trees.**—*Ann. of Appl. Biol.*, xviii, 1, pp. 30–36, 1 pl., 1931.

The disease described in this paper was first observed in 1923

on seedling trees of several new varieties of apple (among which Premier was the most susceptible) at the Royal Horticultural Society's Gardens, Wisley, Surrey. It was characterized by grouped or single horseshoe-shaped or circular cracks in the bark, from $\frac{1}{8}$ to 1 in. in diameter, and small raised blisters, $\frac{1}{8}$ in. in diameter. On some shoots elongated depressed areas occurred which were from $\frac{1}{4}$ to 1 in. in length and separated from the rest of the bark by slight but distinct cracks, from which the epidermis was peeling off in brown flakes. Affected trees were defoliated earlier than normal ones, and similar lesions again appeared on them the following years, in spite of severe cutting back of the diseased shoots. No girdling of the main stem or branches occurred, and the extension of the diseased tissues progressed in a vertical rather than in a horizontal direction. The actual dying back was slight, but many dead buds and patches were found from time to time along the shoots. Sections through the lesions showed the presence of brown specks and streaks in the cortical tissue, sometimes running for a considerable distance from the original surface lesion, and occasionally breaking through to the surface in minute blisters. In natural infections the lesions were mainly confined to the bark, but when inoculations were made extending into the wood, infection progressed vertically in both directions in the latter as well as in the cortex; many of the wood parenchyma cells were destroyed and some of the vessels were filled with a gummy substance and others with bacteria.

Isolations from the lesions yielded practically pure cultures of a short, markedly aerobic, non-sporiferous, Gram-negative, non-acid-fast rod with one to five bipolar flagella, forming on bouillon agar plates round, raised, semi-opaque, white to greyish-white, viscous colonies. Its optimum temperature for growth was 25° to 29° C., there was no growth at 37°, and the death point was 47° to 49°. Some strains developed a slight green fluorescence in the culture medium. Pure culture inoculations into apple stems and twigs gave positive results both in the open and under laboratory conditions, but all attempts to inoculate the organism into apple fruit in various stages of development failed to produce infection. Two out of 40 young pear trees in the vicinity of the infected apples died from apparently the same disease, associated with the presence of an entirely similar organism.

Though certain similarities in the cultural characters of this organism and those of *Bacillus amylovorus* are described, the authors refer the cause of the Wisley disease to *Pseudomonas papulans* Rose [*R.A.M.*, vii, p. 328; x, p. 82]. It is suggested that the organism is a weak parasite capable of attacking trees debilitated by adverse physiological conditions.

ADAMSON (N. J.). **Powdery mildew of the Apple and its control.** —*New Zealand Journ. of Agric.*, xlii, 3, pp. 176–178, 1931.

The author states that, in his opinion, the prevalence of powdery mildew [*Podosphaera leucotricha*: *R.A.M.*, x, p. 317] of apple in New Zealand is, in part at least, due to the ecological conditions there, which have a debilitating effect on the host and favour the development of the disease. He believes that the best way to

control the mildew is to stimulate leaf development and the growth of the tree by good cultivation, adequate manuring, and well-balanced pruning, combining with these the use of protective sprays, including lime-sulphur. He considers that the scorching effect frequently caused by this valuable fungicide is chiefly due to its use on trees already weakened through neglect earlier in the season, and possibly also to its application at a higher concentration than is recommended for the particular stage of growth. He terminates with some practical recommendations for the applications of lime-sulphur sprays.

BALAKHONOFF (P. I.). О гибели цвета плодовых деревьев на Черноморском побережьи в связи с туманами. [Note on the dying-off of fruit tree blossoms on the Black Sea littoral in connexion with fogs.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 169–172, 1930. [Received June, 1931.]

Preliminary field observations in 1929 and 1930 would indicate that the severe killing of fruit tree blossoms (more particularly those of the stone fruits) which is experienced every year on the Caucasian littoral of the Black Sea and is commonly attributed to the deleterious action of the early spring sea fogs, is in reality caused by the activity of *Monilia* [*Sclerotinia*] *cinerea* and secondary attacks of *Cladosporium herbarum*, both of which were invariably found present in every dead or dying blossom examined. The fogs are considered to be only a predisposing factor which, by weakening the tender tissues of the blossoms, renders them very susceptible to attacks by such a weak facultative parasite as *C. herbarum*, while the pathogenicity of *S. cinerea* to fruit blossoms is well known. The reputed resistance of pomaceous fruits to the action of the fogs is only apparent, and is due to the fact that these species usually flower at the time when the sea fogs are least prevalent, since in 1930, when the fogs coincided with the blossoming of the pome fruits, the latter suffered as much as the most susceptible stone fruit trees. The author's contention is further supported by the observation of local growers that an early spring spraying of the trees with 1 per cent. Bordeaux mixture or lime-sulphur mixture greatly minimizes the killing of the blossoms during the fogs.

SMITH (R. E.). **The life history of Sclerotinia sclerotiorum with reference to the green rot of Apricots.**—*Phytopath.*, xxi, 4, pp. 407–423, 6 figs., 1931.

This is an expanded account of the writer's researches on the occurrence of green rot of apricots and almonds (*Sclerotinia sclerotiorum*) in central California, a preliminary note on which has already been published [*R.A.M.*, ix, pp. 323, 766].

BROOKS (F. T.) & BRENCHLEY (G. H.). **Further injection experiments in relation to Stereum purpureum.**—*New Phytologist*, xxx, 2, pp. 128–135, 1931.

Non-living extracts of *Stereum purpureum*, obtained either by water extraction or by precipitation with alcohol [*R.A.M.*, viii,

p. 655], contain two main constituents as shown by injection of these fluids into plum trees, viz., one causing browning of the leaves and another producing silvering. The former is not inactivated by boiling the extract for two minutes and readily diffuses through a collodion sac, while the latter is usually inactivated by boiling and is somewhat less readily diffusible through a collodion sac than the browning extract. No complete separation of the two constituents was effected by dialysis. Neither of the constituents appears, from the available evidence, to be enzymic in nature.

THOMAS (M.). **The production of ethyl alcohol and acetaldehyde by fruits in relation to the injuries occurring in storage. Part II. Injuries to Apples and Pears occurring in the presence of oxygen and in the absence of accumulations of carbon dioxide in the storage atmosphere.**—*Ann. of Appl. Biol.*, xviii, 1, pp. 60–74, 1 pl., 1931.

In this paper, which is in continuation of his studies of the relationship of zymasis to physiological diseases of fruit in storage [*R.A.M.*, ix, p. 114], the author discusses the results obtained in the course of five years from the analysis of apples suffering from the diseases known as 'low temperature internal breakdown', 'soft or deep scald', and 'superficial scald' [ibid., viii, p. 252; x, pp. 114, 467], known to have been incurred in ordinary air storage free from accumulations of carbon dioxide and at low temperatures above 0° C. It was shown that under such storage conditions ethyl alcohol and acetaldehyde do not accumulate in apples (or pears) so long as the fruit remains physiologically healthy, i.e., so long as an irreversible increase in the permeability of the protoplasts of their constituent cells has not been brought about by toxic substances, normal ageing, or in some other way. In apples, however, which have become affected with low temperature breakdown or deep scald, and as these diseases become more profound, these substances progressively accumulate in the unhealthy tissues (but not in the still unaffected tissues). There was no evidence that their formation preceded the incidence of the diseases. It was also shown that when healthy apples are injured either by bruising or freezing at an early stage of their storage life, they undergo zymasis. These facts would suggest that zymasis in air-stored apples is a secondary phenomenon, subordinated to a pre-existing state of incipient cell disorganization which may be brought about by biophysical or biochemical causes which are not yet known. They also indicate that the diseases dealt with in this paper differ essentially from those described in the author's first paper, and that they may be differentiated by chemical analysis. Of particular importance are the differences between deep scald and invasive ethyl alcohol or acetaldehyde poisonings, and it is urged, therefore, that the term scald should be reserved for invasive diseases which occur, independently of carbon dioxide accumulation, in air stores at temperatures above 0° C.

The author further suggests that these findings also apply to the results obtained by other workers on diseases of pears in air stores [ibid., ix, p. 254], although in this case the progressing

disease may be aggravated by zymasic accumulations. A discussion of the two possible interpretations of the causes of zymasis would finally suggest that, during disorganization of the cells of apples and pears, the intricate co-ordination of enzymes in the respiratory centres of the protoplasm breaks down; then, so long as the zymase component remains active, carbohydrate cleavage proceeds, at least in part, all the way to the formation of ethyl alcohol and acetaldehyde.

RIVOIRE (P.). **La dégénérescence des Fraisiers.** [Degeneration of Strawberries.]—*Rev. Gén. d'Horticulture*, ix, 92, pp. 1485–1487, 1931.

During 1930 a wilt of strawberries was reported in many parts of France, and was particularly severe in the vicinity of Lyons. In the first stage of the disease narrow leaves developed and the fruits were smaller and less sweet than healthy ones, while the old leaves, after the fruit had set, thickened and drooped; in the second stage the old leaves turned brown and withered, the flowers set with difficulty and the plant dried up, either wholly or in part. The chief causes of the condition are considered to be an excessively dry soil, inadequate manuring, and unsatisfactory cultural methods.

WARDLAW (C. W.) & McGUIRE (L. P.). **The behaviour and diseases of the Banana in storage and transport.**—*Empire Marketing Board Publ.* 36, 74 pp., 25 figs., 6 graphs, 1931.

This is the complete version of a paper on diseases and decays of banana fruits after picking of which a full abstract by the authors has already been noticed from another source [*R.A.M.*, x, p. 44].

RICCARDO (S.). **Primo contributo allo studio di una malattia che danneggia le Olive in Calabria.** [A first contribution to the study of a disease injuring Olives in Calabria.]—*Ann. R. Istituto Sup. Agrar. di Portici* [formerly *Ann. R. Scuola Sup. di Agric. in Portici*], Ser. III, iv, pp. 176–180, 4 pl., 1931.

In February, 1930, the author received from south Italy a number of young olive branches the fruits of which showed chestnut-coloured, circular or elongated lesions, contracted in the centre and bearing minute, erumpent, black spots. Sections of diseased material showed the presence of a dark, septate, inter- and intracellular mycelium, the old hyphae of which averaged 2·9 to 5·9 μ and the young ones 1·4 to 1·9 μ in diameter. The black spots were caused by pseudoparenchymatous wefts of mycelium, the periphery of which was denser in texture than the centre, the outer cells having thickened walls. In some fruits the stromata had ruptured the epidermis, while in a few others, where the mycelial development was less, they remained completely buried. These stromata are regarded as immature pycnidial or perithecial fructifications, and were globose-depressed and 114 to 133 by 57 to 85 μ in diameter. The fungus was isolated and its cultural characters on various [named] media are described, but all attempts to identify

it failed. On some media conidia resembling those of a *Cladosporium* developed, but there was no formation of perithecial or pycnidial fructifications.

Petri (L.). **Azione tossica dell' arsenito sodico sopra le spore del Gloeosporium olivarum Alm.** [The toxic action of sodium arsenite on the spores of *Gloeosporium olivarum* Alm.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 3, pp. 359–361, 1930.

In view of the fact that in a laboratory test the spores of *Gloeosporium olivarum* (which is stated to be the cause of a common disease of olives, known as 'gaffa', in Portugal and to occur also in Greece, while it has not been reported in France or Italy) [cf. *R.A.M.*, ix, p. 227] were killed after 10 hours' exposure to a 0·5 per thousand solution of sodium arsenite, the author concludes that the spraying mixture used on olives against the olive fly [*Dacus oleae*: ibid., vii, p. 187], and consisting of molasses with 2·5 to 3 per cent. sodium arsenite, acts as a powerful fungicide. Further investigations are to be made to ascertain whether such arsenical applications to the foliage may, under certain weather conditions, indirectly bring about an increased susceptibility to infection.

Wessel (F.) & Kessler (M.). **Schnellmethode zur Bestimmung von Quecksilber in Pflanzenschutzmitteln.** [A rapid method for the determination of mercury in plant protectives.]—*Chem. Zeit.*, lv, 33, p. 318, 1931.

For the separation of mercury from plant protectives containing mercuric chloride, the writers have made use of its property of forming a readily soluble double salt with potassium iodide in water or alkalis. It is thus possible to separate the sublimate from the calcium arsenate, copper oxide, and inert materials which are insoluble in dilute alkalis.

Rupp's method has proved reliable for the determination of mercury in an alkaline potassium iodide solution. The principle of this method is that mercury compounds in an alkaline solution containing potassium iodide are reduced by formaldehyde to metallic mercury. After the acidification of the solution with acetic acid the metallic mercury is brought into solution by the addition of a certain quantity (determined by $n/10$ thiosulphate) of $n/10$ iodide solution. Exact details of the technique of the method are given.

Popoff (M.). **Die Zellstimulation: ihre Anwendung in der Pflanzenzüchtung und Medizin.** [Cell stimulation: its application in plant breeding and medicine.]—375 pp., 42 figs., 3 graphs, Berlin, P. Parey, 1931.

This comprehensive survey of the theoretical and practical aspects of cell stimulation contains a section discussing the importance of the stimulatory action of seed disinfectants on the development of the plants. Numerous citations from the work of recent investigators in this field are given. In the writer's opinion

there is no doubt that the stimulus given to the seed by steeping in certain preparations, e.g., copper sulphate, formalin, uspulun, germisan, and other mercurial compounds, is not confined to the period immediately following treatment but persists until the close of vegetation.

BEWLEY (W. F.). **Practical soil sterilization with special reference to glasshouse crops.**—*Min. of Agric. and Fish. Bull.* 22, 23 pp., 3 pl., 4 figs., 1931.

In this bulletin (which incorporates and replaces the previous leaflets issued by the Ministry on the subject) the author discusses the practical aspects of soil sterilization both on a large scale in glasshouses and in small quantities for market-garden work and propagation purposes. Most of the information given has already been noticed from earlier papers [cf. *R.A.M.*, v, p. 751; ix, p. 258], but of particular interest is the comparison of the cost of the treatment by the various methods described. According to estimates supplied by practical workers, the expense involved by the 'small-grid' method of soil-steaming, after making allowances for the savings in manual labour for digging the soil and in manures, comes to about £130 per acre; the cost of steaming by the 'tray' method varies from about £144 to £83 10*s.* per acre, according to whether it is done very thoroughly for the elimination of disease or whether it is performed as a routine every third year in order to maintain the soil free from disease. In addition to the soil-steaming apparatus noted in the former papers, mention is also made of a method recently described by Moore (*Gard. Chron.*, lxxxv, 1929), which is stated to illustrate how the principles of steam sterilization can be utilized at a minimum of expense.

The paper terminates with a brief discussion of the advantages of soil sterilization by steaming over that by means of chemicals, and with practical recommendations for the proper execution of the sterilization work by steaming or baking.

RIVERA (V.). **Malattie delle piante. Parte generale.** [Diseases of plants. General part.]—108 pp., 7 figs., Rome, Libreria di Scienze e Lettere, 1930.

In reviewing this book Petri [*Boll. R. Staz. Pat. Veg.*, N.S., x, 3, pp. 365–366, 1930] states that the author's aim has been to give a precise and lucid account in elementary terms of the phenomena of susceptibility and resistance as found among the higher plants, with reference to the effects of hereditary and other internal factors and various environmental conditions. The influence of meteorological and soil conditions on the development of infectious diseases, and the effects of temperature and atmospheric and soil humidity on the limitation and spread of fungous diseases are described, and a chapter is devoted to heredity, especially the inheritance of resistance and the application of genetics to the production of resistant varieties of plants. Finally, the author examines in some detail the factors determining resistance to fungi and bacteria, briefly surveying parasitism, variations in virulence, and the active properties of defence possessed by plants.

CAPPELLETTI (C.). **Sull' azione dei prodotti del ricambio di miceli micorizogeni sulle piante ospiti. Ricerche fisiologiche e morfologiche.** [On the action of the products of exchange of mycorrhiza-producing mycelia upon the plant hosts. Physiological and morphological researches.]—*Ann. di Botanica*, xix, 1, pp. 1–62, 3 pl., 2 graphs, 1931.

The mycelium of a species of *Rhizoctonia* forming an endotrophic mycorrhiza on *Allium roseum* in association with the phycomycetoid type [*R.A.M.*, iii, p. 539], was isolated and grown in pure culture, an extract of the crushed mycelium and a filtrate of the culture liquid being then allowed to act upon healthy plants of *A. roseum*, *A. ursinum*, and peas grown in liquid culture on Knop's nutritive solution. Before transferring the *Allium* bulbs to the nutrient solution their roots were removed, so as to induce the formation of a new root system in the cultures. A study [which is fully described] was then made of the toxic effects produced on the plants by the metabolic products of the fungus, with special reference to reduction in the rate of transpiration, histological lesions in the tissues, and disturbances produced in the embryogenetic processes.

The transpiration of the treated plants when compared with that of the controls showed a sharp fall as a result of the effect of the toxin. The filtrate from the culture liquid was more toxic than the extract from the mycelium. The toxin was thermostable. Analysis of the culture liquids before and after the growth of the mycelium showed that a marked increase had taken place in the percentage of purinic nitrogen present: this was much less marked in the mycelium. The addition of various purine derivatives to control cultures of *A. roseum* had an effect in general similar to that of the *Rhizoctonia* culture filtrate. The toxic effect produced by the latter is thought to be chiefly attributable to the katabolic products of the fungus liberated into the culture liquid.

Plants which had recovered from a first exposure to the toxins and which, when replaced in the nutrient solution without the fungal toxins, resumed growth, were found to form thicker leaves, with a greater abundance of stomata, than those formed during their growth in the toxic solutions. This is attributed to the presence in the bulbs of small quantities of the toxins carried over from the earlier culture solutions.

Details are given of a morphological study made of the female gametophyte at the moment of embryogenesis, the toxins being applied in various amounts and at various times with respect to the moment of flowering. Considerable disturbances were caused, from total arrest of development to practically normal completion of the process, according to the dose and time of application. The cells of the embryo were least affected [cf. ibid., ix, p. 197].

Mycorrhizal formation is considered to have an important effect upon the exchange of nitrogenous products, generally shown in a marked dispersal of nitrogen; nitrates are not found in mycotrophic plants, but urea is present.

A four-page bibliography is appended.

Dufrénoy (J.). **Les modifications pathologiques de la structure des cellules végétales.** [Pathological modifications in the structure of plant cells.]—*Ann. Inst. Nat. Agron.*, Sér. 2, xxiii, pp. 1–104, 39 figs., 1930.

In this paper the author brings together his numerous observations and researches on the pathological modifications which take place in the structure of parasitized plant cells. Separate chapters are devoted to studies on normal living matter and its cytological structure, mitochondrial and microchemical technique, pathological changes in the evolution and elaboration of the chondriome, the normal and pathological evolution of the vacuome, and the relations existing between the chondriome and the vacuome [cf. *R.A.M.*, ix, p. 50].

Every cell in its early, meristematic stage is characterized by an active utilization of soluble proteids in order to elaborate lipo-proteid complexes. During this period of active synthesis the vacuome becomes fragmented as small vacuoles disseminated throughout a cytoplasm rich in mitochondria.

When the cell forms part of a parenchymatous tissue it becomes rich in plastids, which tend to collect in the peripheral cytoplasm round a very large central vacuole in which the water-soluble products accumulate. If, however, as it reaches its complete development, the cell continues to receive large quantities of soluble substances, the vacuome tends to retain or reassume the fragmented appearance which it shows in the meristematic cells; further, the circulation of the soluble substances in a definite direction imposes a similar direction on the elements of the vacuome and confers a certain degree of polarity on the cell. This cellular polarization and, more particularly, the polarization of the vacuome-chondriome system is the most constant result of parasitic infection.

In every case studied by the author every pathological excitation compatible with cellular survival provoked a local increase in cellular activity, causing the appearance of small vacuoles in the cytoplasmic area affected; in other words, it increased locally the surface of vacuolar-cytoplasmic contact and brought about a closer vacuolar-mitochondrial contact.

This fragmentation of the vacuome is the cytological expression of the addition of soluble proteids to the vacuolar fluid, and is often accompanied by disintegration of the lipo-proteids of the plastids and hydrolysis of the starch grains, with the formation of reducing sugars; meantime, the chlorophyll disappears and the tissues turn yellow.

The fragmentation of the vacuome, besides being the first result of pathological excitation, is also the first indication of a reversion of the cell towards the meristematic stage. The plastids lose their reserve material, and the chondriome actively divides into chaplets of granular mitochondria, while the cell, as it again becomes meristematic, can help to form a generative layer or a phellogen. Often, instead of taking part in this manner in a hyperplasy, the cell shows only a tendency to hypertrophy, the nucleus breaking up or showing signs of amitotic division.

REYNOLDS (E. S.). **Studies on the physiology of plant disease.**—*Ann. Missouri Bot. Gard.*, xviii, 1, pp. 57–95, 1 fig., 1931.

In the introductory part to this paper the author discusses at some length the complexity of the essential problems involved in the study of the physiology of plant diseases which, in his opinion, require for their solution the active co-operation of specialists in various branches of science rather than purely phytopathological investigations. Particular reference is made to the physiology of resistance to parasitic diseases, several types of which should be recognized as associated with various types of parasitism, though the causes of these two phenomena may not be interrelated. As instancing one type of resistance, details are given of the investigation of the causes underlying the resistance of certain varieties of flax to *Fusarium lini*, which the author's previous work had indicated might be dependent on the presence in the flax plant of the glucoside, linamarine, producing hydrocyanic acid upon hydrolysis [*R.A.M.*, iii, p. 519]. Numerous analyses for HCN in extracts from plants belonging to seven strains of flax, ranging from very resistant to entirely susceptible to *F. lini*, showed great variability in the amount of this glucoside, the balance of evidence tending to indicate the presence of larger amounts in the more resistant strains of flax, and its apparent close association with the young, actively functioning cells. Further experiments [details of which are given] showed the presence of a second, rather thermostable substance in the flax plant extracts, which was toxic to seven of the eight forms of *F. lini* distinguished by Broadfoot and Stakman [ibid., v, p. 490]. This substance is apparently non-dialysable, and is soluble in water, ether, and alcohol. It varies in quantity both according to environmental factors and to the variety of flax. In many extracts it was shown to inhibit completely the development of *F. lini* at the normal concentration of the flax plant sap.

CARBONE (D.) & JARACH (M.). **Sur le mécanisme de l'immunité acquise active chez les plantes.** [On the mechanism of active, acquired immunity in plants.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iii, 2, pp. 54–56, 1931.

The objection having been raised to Carbone's earlier work on immunity in plants [*R.A.M.*, ix, p. 330] that the immunity shown to have resulted from vaccination was in no way related to the life processes of the plant but was merely akin to the perfectly well-known phenomenon of staling, as a result of which the culture medium in which a micro-organism has lived ceases to be adapted for its growth, the authors conducted tests to ascertain whether a vaccinated, reinfected plant can still be attacked by the same organism after being killed by means which change it as little as possible.

To this end Lario beans [*Phaseolus vulgaris*] were germinated in water and after four days transferred to sand, part of them being treated with a culture filtrate of the causal organism of the 'toile' disease [*Botrytis cinerea*: ibid., vii, p. 339], and the remainder receiving water as controls. After nine days the beans were placed in Sachs' nutritive solution, and 10 days later (5th December, 1930) 25 controls and 25 of the plants exposed to

the filtrate which had survived, were inoculated, 14 plants from each lot being placed in a moist atmosphere and the rest in a comparatively dry one. By 15th December 16 of the control lot and 10 of the others were dead. On 11th December one plant in each lot was killed by heat and one by exposure to ether vapour, while on 15th December four in each lot were killed by exposure to solidified carbon dioxide. Immediately after death, each plant was inoculated with *B. cinerea* and placed in a damp atmosphere at 30° C. The fungus developed freely on all the plants.

This result is considered to dispose of the objection raised and to confirm the view that acquired, active immunity in plants, like congenital immunity, is closely related to the life processes of the host.

BARNES (B.). **Induced variation in fungi.**—*Journ. Quekett Microscop. Club*, Ser. 2, xvi, 97, pp. 167–176, 1931.

The variants of *Eurotium herbariorum* induced by heating [*R.A.M.*, viii, p. 192] may be classified in five groups as follows. (1) Young colonies of abnormal shape and colour ultimately yielding normal colonies again. (2) Abnormal young colonies producing slightly abnormal mature colonies, some of which persisted for a short time in culture but ultimately reverted. (3) Definite variants, yielding conidia and perithecia and differing from the normal in shape of colony, rate and density of growth, and a tendency to brown or black pigmentation. These variants, and those of the two following groups, have been maintained in culture since 1927. (4) Definite variants with a marked tendency to produce deformed conidia and perithecia and only a slight formation of green pigment. (5) Definite variants forming conidia but not perithecia, although the yellow pigment associated with the development of these organs may be present.

Similar experiments were carried out with *Botrytis cinerea* [ibid., x, p. 192] and *Thamnidium elegans*. Of the three variants of *T. elegans* obtained, one is of a pale colour, forms no large terminal sporangia, and produces lateral tufts only half the ordinary diameter; the second is also abnormally pale, forms few sporangia, and produces lateral tufts twice the ordinary size; the third is slightly but definitely weaker in growth than the stock form.

WEST (J.) & STUCKEY (W. R.). **Macrophomina phaseoli (Maub.) Ashby in Trinidad. Part I. Parasitism. Part II. Physiology.**—*Mem. Imp. Coll. Trop. Agric. Trinidad* (Mycol. Ser.), 4, 20 pp., 2 pl., 2 graphs, 1931.

In the first part of this paper [by West] details are given of experiments at the Trinidad Agricultural College Farm for the purpose of investigating the parasitism of *Macrophomina phaseoli* [*R.A.M.*, ix, pp. 67, 685]. Of the seven series of tests described, six were made on jute and cotton seedlings in pots, and one on cotton plants under field conditions. They included eight isolations of *M. phaseoli* from America, Dominica, and Trinidad, one isolation from Ceylon, and three isolations of *Diplodia* sp. which were used in comparative trials. All the strains of *M. phaseoli*

belonged to the C group suggested by Haigh [loc. cit.], and it is stated that groups A and B were not found in Trinidad.

The results of the experiments indicated that *M. phaseoli* is not parasitic either on jute or cotton growing under normal conditions [cf. ibid., vii, p. 120]. When kept under very moist conditions, however, jute seedlings in pots were attacked and killed by it. Of 96 cotton plants grown in pots of soil deficient in humus, which was inoculated either with *M. phaseoli* or *Diplodia* sp., four died from attacks of the latter, and 19 deaths were associated with the former. Neither liming, drainage, nor transplanting had any apparent effect on the incidence of the injury caused by either fungus, but manure appeared to be a limiting factor. The young plants wilted and died only when between five and ten inches in height, this agreeing with field observations. It was further shown that under controlled conditions, and to a much lesser degree in the field, young cotton plants are susceptible to attacks by *M. phaseoli* for a certain period of time after severe defoliation, and a certain correlation was traced in this case between susceptibility and the presence or absence of starch in the tissues. All these facts suggest that *M. phaseoli* is a facultative parasite, whose degree of parasitism on cotton is slightly greater than that of *Diplodia* sp., and that its parasitism is bound up with the physiological condition of the host.

In the second part Stuckey discusses the results of his study of the physiology of *M. phaseoli*, which showed that in pure culture acid reactions favour the growth of the fungus on solid and liquid media, although it was able to develop at P_H values ranging from 3 to 9. Direct sunlight was detrimental to rapid growth, the optimum condition in this respect being strong room light. The thermal death point was found to be at or about 55° C. The fungus is not restricted in the choice of sources of nitrogen or carbon, but does not appear to be able to decompose cellulose. No indication was obtained of the production of a toxin by it.

SMITH (K. M.). **Studies on Potato virus diseases. VIII. On a ring-spot virus affecting Solanaceous plants.**—*Ann. of Appl. Biol.*, xviii, 1, pp. 1–15, 5 pl., 1931.

In the course of his studies of the virus diseases of the potato [*R.A.M.*, ix, p. 737], the author investigated a ring spot disease of *Solanum capsicastrum* which was observed in 1929 in a commercial glasshouse in Cardiff, this being, as far as he is aware, the first record of the disease in the British Isles. The outstanding feature revealed by inoculation experiments on the original host and other Solanaceous plants, namely, White Burley and Virginia tobacco, *Datura stramonium*, potato, *Capsicum* spp., tomato, *Nicotiana glauca*, *S. laciniatum*, *S. nigrum*, and *S. nodiflorum*, was the great diversity of the symptoms caused by the virus on these hosts, ranging from mild mosaic on tomato, to mosaic or crinkle on *D. stramonium*, and to a severe streak-like disease in potato; in tobacco the virus exhibited a greatly varying degree of virulence, the less virulent form being associated with the production of ring spots on the leaves and occasionally on the stem, and later with a severe necrosis of the veins and stems, while the more severe

form, which was fatal to about 50 per cent. of the infected tobacco seedlings, produced a streak-like disease the chief symptoms of which were the repeated killing of the growing points of the plants as they formed, together with the development of brown lesions on the leaves that survived. In some cases the plants affected by this form died down except for the central shoot which, in time, produced a new plant devoid of all symptoms; four or five weeks later, however, the severe symptoms broke out anew and the plants again collapsed; occasionally such a temporary recovery occurred two or three times, but finally the plants remained in a necrotic and moribund condition.

Another point of interest was the difference in receptivity to the ring spot virus of the various species tested when transmission was effected by the aphid *Myzus persicae.* This insect was shown to be able to infect both *Datura* and *Capsicum* when brought from infected *Datura*, but so far all attempts to infect the other Solanaceous plants (with the exception of a doubtful infection on tobacco) with the ring spot virus by means of *M. persicae* failed. All attempts to inoculate plants belonging to other orders than the Solanaceae also gave negative results.

In discussing the results of his investigation, the author points out the close parallellism in the behaviour of this ring spot virus to the viruses of the potato mosaic-crinkle-streak group previously described by him [loc. cit.]. Although the variety of symptoms caused by it in the plants tested might be thought to indicate that it is a complex of viruses, so far as could be ascertained it is a single entity, and the wide variations in its behaviour are believed to offer some evidence that the number of different viruses of the potato mosaic group is not so large as one might be led to believe from current descriptions [see next abstract].

SMITH (K. M.). **Composite nature of certain Potato viruses of the mosaic group.**—*Nature*, cxxvii, 3214, pp. 852–853, 1931.

In 1928 it was shown that needle and aphid (*Myzus persicae*) inoculations on tobacco with virus from the same mosaic potato plant produced distinct symptoms characteristic of the method of infection [*R.A.M.*, viii, p. 521]. The disease produced by the needle has since been shown to be a complex, the constituent viruses of which are here designated x and y, the former (needle inoculation) representing the virus causing the formation in tobacco of double concentric rings with a central spot ('ring spot'), and the latter (the aphid-borne virus) inducing a darkening of the green colour along the vein tissues.

By development of a technique of virus isolation from a complex within the living plant, much evidence has been accumulated that certain potato viruses of the mosaic group are not single entities but are composite in character [see preceding abstract]. This applies, *inter alia,* to a mosaic from Arran Victory potato, a crinkle from Myatt's Ashleaf, a streak carried without symptoms by Up-to-Date [see above, p. 584], and a streak also carried by Di Vernon. All these diseases have been separated into their constituent viruses in three different ways. (1) By the use of the selective relationship existing between *M. persicae* and tobacco. (2) By the

use of 'filter' plants, i.e., plants susceptible to one component of the virus mixture but not to the others. With the above-mentioned potato mosaic, for instance, examples of plants susceptible to the virus *y* isolated by means of *M. persicae* are *Hyoscyamus* sp., tomato, and *Solanum nigrum*, and of the filter plants resistant to this virus, *Datura stramonium* and *S. dulcamara*. All are susceptible to the ring spot virus *x*. (3) By taking advantage of the unequal rates of movement of the constituent viruses within the host (a) at the moment of development of primary symptoms in the young plant inoculated with the virus complex, and (b) in the ageing plant.

By this technique several virus complexes were analysed in the tobacco plant into their constituent parts and then synthesized. Thus, needle inoculation to tobacco from a streak-carrying Up-to-Date potato produced a virulent disease marked by gross lesions and severe necrosis of the veins without a trace of rings, while aphid transmission from the same plant induced in tobacco the disease *y*, with characteristic symptoms. On passage of the necrotic complex through one of the above-mentioned filter plants back to tobacco, the disease assumed a ring spot form with numbers of well-defined double concentric rings, each with a central spot there was no general necrosis. The primary symptoms of this disease are double rings on the inoculated leaves. The virus *y*, isolated from the complex by means of the aphid, was added to a number of tobacco plants showing this ring spot. After the usual incubation period the primary symptoms peculiar to the aphid-transmitted virus *y* developed, whereupon the rings rapidly lost their regular outline, filled up, and degenerated into irregular, necrotic lesions, accompanied by severe necrosis of the veins. In a short time the symptom picture was identical with that of the necrotic disease before separation.

Most of the diseases studied by these methods were found to contain only two constituent viruses, but in a streak and a crinkle there is evidence of the occurrence of a third constituent. In certain cases only one virus can be isolated, and here it is reasonable to suppose that the disease is a single entity. There is some evidence that the failure of *M. persicae* to transmit the ring spot disease produced in tobacco by needle inoculation with these potato viruses is due rather to a selective action on the part of the tobacco plant itself than to any discriminative capacity of the aphid.

The ring spot diseases described in this paper are stated to be quite distinct from those affecting tobacco in nature. The vein-banding occurring naturally on tobacco in Kentucky fields (to which *D. stramonium* is believed to be resistant) [ibid., x, p. 409] is thought to be probably identical with the above-mentioned aphid-borne virus *y*.

GOSS (R. W.). **Infection experiments with spindle tuber and unmottled curly dwarf of the Potato.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 53, 36 pp., 1931.

In the first part of this bulletin the author gives an account of his field observations in western Nebraska and experiments under controlled conditions on the transmission by various insects of

potato virus diseases, with particular reference to spindle tuber and unmottled curly dwarf, the results of which have already been noticed from a preliminary report [*R.A.M.*, ix, p. 401]. In addition to the information already noted, it is stated that transmission tests with grasshoppers (*Melanoplus* spp.) and the tarnished plant bug (*Lygus pratensis*), both of which can transmit these two diseases, gave negative results with mild and rugose mosaic and leaf roll, while flea-beetles (*Epitrix cucumeris*) failed to transmit mild mosaic and leaf roll. Neither spindle tuber nor unmottled curly dwarf was transmitted by inoculation into healthy potato plants of the saliva or of the extract from the stomach of grasshoppers that had been fed on infected plants. There was evidence that spindle tuber and unmottled curly dwarf potato plants also carry the virus of the 'masked' mosaic of apparently healthy plants, since mosaic developed on *Datura stramonium*, *Nicandra physaloides*, and *Physalis heterophylla* plants inoculated with juice from the former, the symptoms resembling those caused by the healthy potato virus and inoculations back to potato producing no apparent effect. Both diseases were transmitted by contact between a healthy tuber seed piece and a piece from a diseased tuber, and also by cutting seed tubers with an infected knife. It was further shown that the spindle tuber virus did not spread or diffuse readily throughout healthy tubers in storage, when the latter were inoculated by means of plugs from diseased tubers. The spindle tuber virus retained its infectivity at higher dilutions than that of unmottled curly dwarf, although with both viruses only a few doubtful infections were obtained with dilutions over 1 in 1,000. The thermal death point of the virus of unmottled curly dwarf was found to lie between 75° and 85° C.

FERNOW (K. H.). **Potato growing in Bermuda.**—*Amer. Potato Journ.*, viii, 6, pp. 150–153, 1931.

Much difficulty is stated to be experienced in Bermuda in the control of leaf roll and other virus diseases in Bliss Triumph and Garnet Chili potatoes grown for export. Leaf roll plants usually give no yield at all instead of the one-third generally obtained in the United States from diseased crops. Late blight [*Phytophthora infestans*] is serious on Garnets, while the early blight fungus [*Alternaria solani*] forms large lesions, involving the whole leaf, especially on Bliss Triumph. Heavy losses may also be caused by scab [*Actinomyces scabies*].

GRATZ (L. O.). **Potato spraying and dusting experiments in Florida, 1924 to 1929.**—*Florida Agric. Exper. Stat. Bull.* 222, 39 pp., 3 maps, 1930. [Received July, 1931.]

This bulletin gives a fuller account than that already noticed from a previous paper [*R.A.M.*, ix, p. 554] of the spraying and dusting experiments conducted in Florida since 1924 for the control of early and late blights of potatoes (*Alternaria solani* and *Phytophthora infestans*), but contains no new information of importance.

SOLOVIEVA (Mme N. V.). **Наблюдения над болезнями Картофеля в Терском округе в 1927–1928 г.** [Observations on Potato diseases in the Terek district in 1927–1928.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 85–94, 1930. [German summary. Received June, 1931.]

The author states that observations in 1927 and 1928 showed the presence on the grounds of the Terek [North Caucasus] Plant Protection Station and in the neighbouring villages of the following potato diseases: namely, a species of *Verticillium* (first record for the district), *Phytophthora infestans*, *Hypochnus* [*Corticium*] *solani*, *Macrosporium* [*Alternaria*] *solani*, *Fusarium* spp., and *Phoma* sp., besides degeneration diseases, chiefly leaf roll. The examination of herbarium material collected in those two years also revealed the presence on some potato stems, near the collar, of *Colletotrichum solanicolum* [*C. atramentarium*: *R.A.M.*, x, p. 203]. The diseases of the greatest economic importance in the region are stated to be the degeneration diseases and that due to the species of *Verticillium.*

POSTELT (R.). **Fäulnis-und Schorferscheinungen der Kartoffelernte 1930.** [Decay and scab manifestations of the 1930 Potato harvest.]—*Deutsche Landw. Presse*, lviii, 14, p. 197, 1931.

Widespread decay took place in storage among the early and medium-early potato varieties in Germany during 1930, when a dry early summer was followed by an excessively rainy period from the middle of July until the late autumn. Late and medium-late varieties, on the other hand, remained free from decay and also from scab [*Actinomyces scabies*: *R.A.M.*, x, p. 402], which was particularly severe on sandy soils [see next abstract]. The greater the binding capacity and the higher the humus content of the soil, the higher degree of alkalinity it will tolerate without inducing scab. In sandy soils a slightly acid reaction should be maintained by the application of acid manures.

SCHLUMBERGER [O.]. **Prüfung von Kartoffelsorten auf ihr Verhalten gegen Schorf im Jahre 1930.** [Testing of Potato varieties for their reaction to scab in the year 1930.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlvi, 12, pp. 229–232, 1 fig., 1931.

Full details are given of the official German experiments on varietal reaction to potato scab (*Actinomyces scabies*) conducted in four localities of the Mark Brandenburg, two on light sandy and two on heavy clay soil.

The results of the tests [which are tabulated] showed that severe scab infection was almost always correlated with high P_H values [*R.A.M.*, x, p. 126 and preceding abstract]. Of the varieties tested for the third time Maibutter was the only early one to be placed in the resistant class (at least 60 per cent. of the tubers smooth or with isolated scab pustules), and even this failed to give satisfactory results on one of the sandy soils. Albabona and Beate I show sufficient resistance on clay but not on sandy soil, while Frühe Hörnchen and Tannenzapfen are definitely susceptible. The early and medium-early varieties, Berlichingen,

Frühe Ertragreiche, Konsum, and Vesta, tested for the second time, were very resistant on the clay soils but failed to maintain this character on the sandy ones. A high degree of resistance was shown, among the medium-late and late varieties in the second year of testing, by Ackersegen and Dauerragis, while Gneisenau, Goldadler, Blaue Gelbfleischige, and Datura also gave moderately satisfactory results. Goldfink, on the other hand, must be classed among the susceptible varieties, at any rate on sandy soils. Among the varieties tested for the first time, the most promising was Rhenoragis. Ök.-Rat Mathis, like Blaue Gelbfleischige, shows a fairly high incidence of infection but slight pustule formation, while in Rhenoragis the degree of infection is low but pustules are numerous.

LEACH (J. G.). **Further studies on the seed Corn maggot and bacteria with special reference to Potato blackleg.**—*Phytopath.*, xxi, 4, pp. 387–406, 14 figs., 1931.

In a comparative study [full details of which are given] of the normal internal bacterial flora of the seed-corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*), the principal bacteria associated with potato blackleg (*Bacillus phytophthorus*) [*R.A.M.*, x, p. 125], and certain soil-inhabiting bacteria, several species occurring in each of these groups were found to be identical. *B. phytophthorus* was obtained from each of the three groups, though certain soil saprophytes, including *Pseudomonas* [*Bacterium*] *fluorescens* and *P.* [*Bact.*] *non-liquefaciens*, apparently predominated. The kinds of bacteria associated with the insect appear to be determined largely by the nature of the material on which it feeds. Flies developing in potato plants affected by blackleg are naturally more likely to carry the pathogen than those occurring in organic matter destroyed by the common soil saprophytes.

Nutritional investigations indicate that bacteria aid the development of the larva of *P. cilicrura* by converting the plant tissues in the food into a more readily assimilable form. The capacity of the larva to make normal growth on seed partly decayed by bacteria and then sterilized by heat, as well as on sterile germinating bean seed, shows that the bacteria themselves do not necessarily serve as food for the insect.

GARBOWSKI (L.) & LESZCZENKO (P.). **Rozpowszechnienie raka Ziemniaczanego i postępy badań nad odpornością odmian Ziemniaków przeciw Synchytrium endobioticum (Schilb.) Perc.** [Spread of the Potato wart disease and progress made in investigating the resistance of Potato varieties to *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydziału Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Section State Inst. Agric. Sci. in Bydgoszcz*], 10, pp. 3–42, 2 pl., 1931. [French summary.]

The chief point of interest in this paper [the introductory part of which gives a brief historical outline of the spread and present-day distribution of the potato wart disease (*Synchytrium endobioticum*) in different parts of the world], is the description of a development devised by the authors at Bydgoszcz [Poland] of

Miss Glynne's method for infecting potato tuber sprouts with summer sporangia of the organism under laboratory conditions [*R.A.M.*, iv, p. 501; ix, p. 802]. It was found that the difficulty of procuring sprouting tubers of the new crop at the end of the summer or early in the autumn can be in part obviated by subjecting freshly dug tubers to a temperature of 1° to 3° C. during 40 days in a refrigerator, after which they sprout freely within 10 days of their transference to damp sand at 20°. The infection method itself consists in placing a glass ring of appropriate diameter and 5 to 7 mm. high around a group of germinating buds, 1 to 2 mm. in length, and affixing it to the surface of the tuber by means of ordinary laboratory cement (equal parts of rubber and paraffin). The ring is then filled with tap or rain (but not distilled) water and a piece of a young wart containing active summer sporangia is placed on it so as to be partly immersed in the water; it is recommended to avoid submerging the cut surface of the outgrowth. The tubers thus prepared are placed on moist sphagnum in wooden boxes and covered either with sphagnum or a glass plate, and the whole is left for 48 hours at laboratory temperature (12° to 18° C.), after which the glass rings are removed and the tubers are left for another 8 or 10 days on moist sphagnum at 15° to 20°. This method is stated to have given up to 100 per cent. successful infection with susceptible varieties such as Early Rose, Deodara, and Wohltmann, and to have definitely shown that many of the varieties described in Germany as 'nearly immune' or 'highly resistant' are in reality susceptible in varying degrees. Such varieties [a short list of which is appended] are termed by the authors 'pseudo-resistant', and great stress is laid on the danger of their importation into uninfected regions; they should only be grown in already infected areas, where their use may give a more or less normal yield.

KÖCK [G.]. **Der Kartoffelkrebs in Finnland.** [Potato wart in Finland.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931*, 1, p. 19, 1931.

The writer has received a personal communication from A. Hitti, of the Phytopathological Institute of Helsingfors University, stating that wart disease of potatoes [*Synchytrium endobioticum*] is only present in the south-west of Finland [*R.A.M.*, ix, p. 670], where the total infected area at the end of 1930 comprised some 21 hect., chiefly in small-holdings. The disease is stated to have been introduced into the country as early as 1893 with an English consignment, and has since spread to eleven parishes, while a twelfth has become infected by Dutch potatoes imported in 1929.

Behandeling van bruinen binnenbast. [Treatment of brown bast.]—*De Bergcultures*, v, 15, pp. 402–403, 1931.

It is stated that no important modifications have been made in the official recommendations recently issued by the A.V.R.O.S. Experiment Station in their circular No. 34 (replacing No. 21 of 1923) concerning the treatment of brown bast of *Hevea* rubber in the Dutch East Indies [*R.A.M.*, iii, p. 423]. Directions are given for the detection of fresh infections and the treatment of large

and small diseased areas of bark. In times of low rubber prices trees normally producing less than 20 c.c. of latex per tapping should not be treated but they should be excluded from tapping.

LOBIK (A. I.). О распространении на Северном Кавказе ложной мучнистой росы—**Pseudoperonospora humuli** на Хмеле. [Distribution in North Caucasus of downy mildew *Pseudoperonospora humuli* on Hops.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 95–98, 1930. [German summary. Received June, 1931.]

Since 1924, when downy mildew of hops (*Pseudoperonospora humuli*) was first discovered in the district of Vladikavkaz, it has been found every year on wild hops practically over the whole North Caucasus, both on wooded and cultivated land. In view of the fact that hops are not cultivated in that region, there is no possibility of the disease having been introduced with cuttings from abroad, and the author believes that a careful search will reveal the existence of endemic centres of infection [cf. *R.A.M.*, viii, p. 600]. Under local conditions the chief symptom is the development of diffuse, dirty greyish spots on the upper side of the leaves, which frequently coalesce and invade the greater portion of the leaf; the under surface of the spots is covered with a delicate, dense, greyish mycelial felting. The conidiophores are grouped in tufts of 5 or 6. They are hyaline, slightly branched, and 114 to 274 by 4 to 8·8 μ. The conidia are slightly smoke-coloured, elliptical or ovoid, and measure 15 to 32·4 by 14 to 22 μ in diameter.

ZATTLER (F.). **Ueber die Einflusse von Temperatur und Luftfeuchtigkeit auf Keimung und Fruktifikation von Pseudoperonospora humuli und auf das Zustandekommen der Infektion des Hopfens.** [On the effects of temperature and atmospheric humidity on germination and fructification of *Pseudoperonospora humuli* and on the occurrence of infection of the Hop.]—*Phytopath. Zeitschr.*, iii, 3, pp. 281–302, 3 figs., 5 graphs, 1931.

The optimum temperature for the germination of *Pseudoperonospora humuli*, the causal organism of downy mildew of hops, was found to lie between 17° and 20° C. in the author's experiments in hanging drops in moist chambers [*R.A.M.*, vii, p. 399; ix, p. 60]. The duration of zoospore formation at 18° to 20° ranged from 55 minutes to 2¾ hours according to the age of the conidia (3 days old in the former case and 8 to 10 in the latter). In 1927 it was found that conidia kept at a temperature of 18° to 22° were partially viable after four weeks, while those on dried diseased lateral shoots kept in a sealed glass vessel and periodically moistened were still viable at the end of 36 days. The oospores of the fungus require several days for germination and the prolonged moisture conditions necessary for this purpose are normally found only in damp soil.

The minimum temperature for infection by *P. humuli* is 4°, at which point the formation of zoospores from fresh conidia takes some 3½ hours. However, since the production of germ-tubes

takes considerably longer, at least half a day must be reckoned for the occurrence of infection at this temperature, during which time the plant must remain moistened with water. Infection at 4°, therefore, is scarcely probable though theoretically possible. At 18° to 22°, on the other hand, infection may occur within an hour. The maximum temperature for infection is probably about 30°, at which point zoospores are formed only by fresh material and do not remain motile more than 25 minutes.

The author's infection experiments on Hallertauer hops showed that the new conidiophores may develop in four to eleven days after infection, the corresponding figures for Schwetzinger and for Spalter and Golding being 5½ to 6½ and 6 to 7 days, respectively. In the first-named variety fructification occurred in 4 days after infection at 17·4°, in 6 days at 13·8°, in 11 days at 11·6°, in 5 days at 19·3°, and in 4½ days at 21·9°. The minimum temperature for fructification was below 5° and the maximum about 29·5°. A correlation was found between the time required for fructification and the resistance or susceptibility of the variety. The short incubation period of *P. humuli*, as compared with that of *Plasmopara viticola*, necessitates frequent spraying. It has, however, been possible to reduce the number of applications of Bordeaux mixture in Bavaria from the 14, 16, or even 20 that were given in 1927 to 7 to 10 without detriment to the hops. The time of conidial formation is the critical moment for spraying the foliage, whereas in the case of the cones the conidiophores may develop four to six days before the red spotting characteristic of the disease.

It was shown by experiments that the mycelium of *P. humuli* can only fructify in the presence of sufficient moisture, i.e., when indoor plants are kept wet by sprinkling and wrapping in damp cloths. On other plants in the same room, the temperature of which ranged from 17° to 22° and the atmospheric humidity from 45 to 70 per cent., infection came to a standstill.

The average dimensions of 61 oospores from cones and diseased shoots were found to be 38 by 35 μ, with a maximum diameter range of from 31 to 51 μ.

LEE (A.) & MEDALLA (M.). **P.O.J. 2878 is susceptible to Cane smut.**—*Sugar News*, xii, 4, pp. 220–221, 1931.

Accurate counts of the incidence of infection by three major diseases have been made at Luzon, Philippine Islands, and are here presented in tabular form. P.O.J. 2878 (3rd ratoons), contrary to expectation, showed some degree of susceptibility (9·30 per cent.) to smut [*Ustilago scitaminea*: *R.A.M.*, ix, pp. 340, 808]. One of the progenitors of this variety being the highly susceptible *Saccharum spontaneum* [ibid., ix, p. 745], the inheritance of liability to smut is perhaps not altogether surprising. The same variety showed 1·86 per cent. mosaic and 1·86 per cent. Fiji disease [ibid., x, pp. 58, 340]. Negros Purple (2nd ratoons) was practically free from smut and Fiji disease (0·73 and 0·729 per cent., respectively), but showed 9·67 per cent. mosaic. The third ratoons of Badila contracted no smut but showed 6·17 and 4·69 per cent., respectively, of Fiji disease and mosaic. The second ratoons of P.O.J. 2883

were also entirely free from smut, the incidence of Fiji disease and mosaic being 2·15 and 11·37 per cent., respectively.

STEVENS (F. L.). **Parasitic fungi of Peru and Ecuador.**—*Ann. Mycol.*, xxv, 1–2, pp. 102–106, 3 figs., 1931.

Taxonomic notes are given on 30 species of fungi (mostly parasitic) collected by the author in Peru during 1924. The one new genus and six new species are furnished with diagnoses in English.

SPARROW (F. K.). **Two new species of Pythium parasitic in green algae.**—*Ann. of Botany*, xlv, 178, pp. 257–277, 1 pl., 2 figs., 1931.

This is a detailed account, with diagnoses in English, of the morphology and life-history of two species of *Pythium* with filamentous sporangia, considered to be new to science and named *P. adhaerens* and *P. angustatum*, which were found parasitizing species of green algae in the neighbourhood of Cambridge, Massachusetts. The formation of appressoria and the maturation of the zoospores and sexual spores in both species are dealt with at length. The zoospores exhibited direct diplanetism [*R.A.M.*, ix, p. 611], and in the germination of the oospores of *P. adhaerens* the young mycelium forms sporangia and each cystospore (the term used by the author to designate the zoospore after it comes to rest) may give rise to from two to five fresh zoospores. As many as four repeated emergences were observed in such zoospores, so that the period of swarming is greatly prolonged. Sex organs, unusually small, are occasionally formed on the germ hyphae of these cystospores. Occasional oogonia of *P. angustatum* were found to include from three to five oospores.

Besides other species of algae, *P. adhaerens* was found to be capable of parasitizing, when artificially inoculated, maize, peas, tomato, cucumber, and musk melon, and *P. angustatum* was parasitic on maize.

KLEBAHN (H.). **Kulturversuche und Bemerkungen über Rostpilze. XVIII Bericht (1925–1930). Mit einem Anhang über Ustilago longissima.** [Culture experiments and observations on rust fungi. XVIIIth Report (1925–1930). With a supplementary note on *Ustilago longissima*.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 5, pp. 209–223, 1 fig., 1931.

Further notes are given on the author's investigations on the heteroecious rusts [*R.A.M.*, iv, p. 375]. *Cronartium ribicola*, the teleutospore stage of *Peridermium strobi* Kleb., the causal organism of white pine blister rust [ibid., ix, p. 691], is mostly cited in American phytopathological literature as *C. ribicola* Fischer. This practice is criticized by the author on the grounds that Fischer's description of the rust is no better than Dietrich's (in neither case was a technical diagnosis given), and since Dietrich discovered the fungus in 1855 while Fischer first observed it in 1871, the right of priority should be assigned to the former.

Black currant bushes that proved highly resistant to inoculation by the teleutospores of *Puccinia pringsheimiana* [ibid., viii, p. 254] derived from aecidiospores on gooseberry showed heavy infection on inoculation with teleutospores obtained from aecidia of the rust on *Ribes alpinum*. These last-mentioned teleutospores were equally virulent when inoculated on to gooseberries, the shoots on some bushes being killed and the plants suffering severely. Many of the aecidia on the numerous lesions produced by *P. pringsheimiana* on black currants failed to rupture, so that considerable difficulty was experienced in obtaining sufficient spore material for the transference of the rust back to *Carex*; this is believed to be an instance of incomplete adaptation of the fungus to an originally uncongenial host. In addition to the black currant plants kept in pots for these experiments and used year after year, a number of others procured some time ago from a nursery were inoculated with entirely negative results, pointing to a high degree of resistance in these individuals.

Young wheat plants were readily infected by the aecidiospores of *Puccinia triticina* from *Thalictrum flexuosum* and *T. glaucum* plants that had been inoculated with teleutospores of the rust from wheat [cf. ibid., ix, p. 768]. *Thalictrum* spp. are of relatively uncommon occurrence in Germany and seldom bear the aecidia of *P. triticina*, which is evidently capable of overwintering there in the uredo stage. In the Hamburg district, where barberries are only sparsely represented in gardens and the aecidia of *P. graminis* are seldom found, the form of the rust attacking rye is very prevalent in the autumn on *Agropyron repens* [ibid., iv, p. 377].

Hyalopsora polypodii [ibid., v, p. 334], parasitic on *Cystopteris fragilis*, is evidently a heteroecious rust, but its aecidial stage has not yet been detected in Germany, where the fungus is of rare occurrence. Plants of *C. fragilis* from Marburg bearing the uredospores of the rust were kept for several years in the hope of securing the teleuto stage, but this failed to develop though fresh uredosori were formed in each successive year. The rust, therefore, is capable of overwintering in the latter stage. Specimens of *C. fragilis* from the Hamburg Botanic Garden failed to contract infection on inoculation with *H. polypodii*.

Legislative and administrative measures. French Colonies.—*Internat. Bull. of Plant Protect.*, v, 5, p. 78, 1931.

As from 2nd February, 1931, the Decree of 3rd December, 1929, concerning the protection of cacao plantations in certain French colonies [*R.A.M.*, ix, p. 752] has been modified as follows. The importation, circulation, storage, and transit are prohibited of plants, plant parts, pods, and fresh beans of cacao, also of the soil and packing materials accompanying them, coming either from countries in which witches' broom (*Marasmius perniciosus*) is known to occur or from those where the importation of such plants or parts thereof is not prohibited or is not subject to phytopathological control. These regulations are applicable to the specified products from Central and South America, Mexico, and the West Indian Islands.

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MARTINEZ (J. B.) & GUINEA (E.). **Nueva aportación a la micoflora española.** [New contribution to the Spanish mycoflora.]—*Bol. R. Soc. Española Hist. Nat.*, xxxi, 3, pp. 211–220, 4 figs., 1931.

Notes are given on some fungi not previously recorded in Spain. Amongst the parasitic forms mentioned *Isaria guignardi* Mah. f. *major*, characterized by filiform synnemata 25 to 32 mm. in length, conidiophores 37·5 to 56 μ long, and conidia 5·5 to 6·5 by 3 to 4 μ, was found parasitizing *Troglorites breuili* in Navarre in August, 1929.

CIFERRI (R.). **Quinta contribuzione allo studio degli Ustilaginales. (No. 127–257.)** [Fifth contribution to the study of the Ustilaginaceae. (Nos. 127–257.)]—*Ann. Mycol.*, xxix, 1–2, pp. 1–74, 17 graphs, 1931.

Continuing his studies on the Ustilaginaceae [*R.A.M.*, vii, p. 674], the writer gives further critical and taxonomic notes on a number of species from various sources. A new species of *Tuburcinia* (*Urocystis*) is created for the fungus distributed in Briosi and Cavara, Fungi parassiti, No. 206, as *U. occulta* on the leaves and culms of two-rowed barley (*Hordeum distichum*) from Avellino, Italy, viz., *T. hordei*. It differs in the following particulars from *T.* (*U.*) *occulta* on rye: spore balls usually composed of one, rarely two, or very rarely three fertile spores; sterile cells generally absent, occasionally one or two, very rarely up to six present; peripheral cells usually 7 to 8 by 2 to 3 μ. It is considered likely that the records of *U. occulta* on *H. vulgaris* really refer to this species.

The smut referred to *Tolyposporium penicillariae* Bref. collected by F. C. Deighton on bulrush millet (*Pennisetum typhoideum*) in Sierra Leone in 1929 [*R.A.M.*, vi, p. 398; viii, p. 291], is stated to be identical in macro- and microscopical characters with the earlier described *Ustilago penniseti* (Kunze) Rabenh. The diameter of the spores ranges from 7 to 12 μ, the largest number of those examined (89 out of 200) falling in the class measuring 9 μ. A key is given to the smuts so far recorded on species of *Pennisetum*.

The author has examined critically the smuts found on species of *Saccharum* in India and agrees with Sydow's conclusions in regard to the sugar-cane smut (*U. scitaminea*) and related species [ibid., iv, p. 127].

WOLLENWEBER (H. W.). **Fusarium-Monographie. Fungi parasitici et saprophytici.** [*Fusarium* monograph. Parasitic and saprophytic fungi.]—*Zeitschr. für Parasitenkunde*, iii, 3, pp. 269–516, 71 figs., 1931. [German.]

The author here presents the results of his extensive field and laboratory investigations (the latter comprising pure culture experiments and the examination of exsiccata) of 64 species, 79 varieties, and 38 forms of the form genus *Fusarium*, classified in 16 groups and 9 subgroups. These are furnished with keys in Latin, and Latin diagnoses are also given of the different species, together with notes on their occurrence and distribution, a critical examination of previous descriptions, and exact dimensional data based on personal study. Diagnoses of the perfect stages already known of 12 out of the 16 groups, belonging to the genera *Nectria*, *Gibberella*, *Calonectria*, and *Hypomyces*, are appended to the descriptions of the corresponding *Fusarium* stages for comparative purposes [cf. *R.A.M.*, v, p. 700]. The present section of the monograph comprises only 10 out of the 16 groups, viz., *Eupionnotes*, *Spicarioides*, *Arachnites*, *Arthrosporiella*, *Gibbosum*, *Discolor*, *Lateritium*, *Liseola*, *Elegans*, and *Ventricosum*, the remaining 6, namely, *Macroconia*, *Submicrocera*, *Pseudomicrocera*, *Sporotrichiella*, *Roseum*, and *Martiella*, being reserved for future discussion.

Numerous species formerly considered to belong to *Fusarium* have been excluded from this genus as a result of the author's studies. The scope of the work has therefore been extended to cover other genera of the Fungi Imperfecti and related Hypocreaceae. Certain fungi having no *Fusarium* stage, e.g. *Melanospora* sp. and *N. cinnabarina*, as well as *Neocosmospora*, in which this stage is rudimentary, are also included as an indication of the limits of *Fusarium* [cf. ibid., ix, p. 736].

F. oxysporum is considered to include a group of forms, two of which are represented by the banana wilt-producing fungi commonly known as *F. cubense* and *F. cubense* var. *inodoratum* [cf. ibid., v, p. 766]. *Pseudonectria musae* Hochapfel was found in decaying banana fruits from America in association with *F. moniliforme* var. *minus*. *Cylindrocarpon bulborum* n. sp. was obtained on narcissus bulbs in Great Britain and *C. curvatum* Hochapfel, on rotted apples in Germany and on wheat in Denmark. Notes are given on a number of other new species, on 15 new varieties, 7 new forms, and 8 new combinations and specific names, while proposals are made for 28 new combinations of varieties and 25 new combinations of forms.

In an appendix some critical observations are made on *F. celosiae* on *Celosia cristata* in Japan [ibid., viii, p. 245], for which the new combination *Gibberella fujikuroi* (Saw.) Wr. is proposed; *F. oxysporum* var. *gladioli* [ibid., viii, p. 382]; and *F. oxysporum* var. *medicaginis* [ibid., ix, p. 188].

ENDO (S.). **The host plants of Hypochnus centrifugus (Lév.) Tul. ever recorded in Japan.**—*Trans. Tottori Soc. Agric. Sci.*, iii, pp. 254–270, 4 pl., 1931.

A list is given of 159 plants belonging to 55 families which are subject to infection by *Hypochnus centrifugus* [*Corticium centri-*

fugum] including its sclerotial stage (*Sclerotium rolfsii*) in Japan [*R.A.M.*, viii, p. 449]. Twenty-two of these, including *Aralia cordata*, *Lupinus luteus*, peas, and *Capsicum annuum*, have been newly discovered by the writer's researches.

STEINMANN (A.). **Over een nieuwe ziekte van de Dadap (Erythrina subumbrans) in Nederlandsch-Indië.** [On a new disease of Dadap (*Erythrina subumbrans*) in Dutch East Indies.]—*De Bergcultures*, v, 11, pp. 282–284, 3 figs., 1931.

Dadap (*Erythrina subumbrans*) [*E. lithosperma*] trees growing (as a green manure) in tea gardens in Java have been infected by a species of *Fusarium* which was isolated in pure culture on rice and glucose-peptone-agar, on which it produced oval to piriform, oblong, or reniform microconidia, 5·4 to 12·6 by 1·8 to 5·4 μ and oblong to falcate, 5-septate macroconidia, 61 to 75 μ in length (average 68 μ). The fungus is believed to be the cause of the desiccation and olive to brown discoloration of the branches, accompanied by dark vesicular swellings, the moisture in which dries up so that the cortex shrivels and peels off. A similar disease has been described by Park from Ceylon [*R.A.M.*, viii, p. 688], where it is favoured, as in Java, by excessive rain.

KVASHNINA (Mme E. S.). Болезни Табака в Сочинском районе Черноморского округа по наблюденіям **1929 г.** [Tobacco diseases in the Sotchi area of the Black Sea district according to observations in 1929.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 247–260, 7 figs., 1 graph, 1930. [German summary. Received June, 1931.]

In this paper, brief preliminary accounts are given of the chief diseases of tobacco (*Nicotiana tabacum*) recorded in 1929 in the Sotchi area of North Caucasus. The most important was that locally known as 'ryaboukha' [*R.A.M.*, x, p. 412 and next abstract], in which the following six forms of leaf spotting may be macroscopically distinguished, the first three being definitely of bacterial origin, while the cause of the others is as yet undetermined. (1) A form closely resembling the American wildfire [*Bacterium tabacum*]. (2) Rounded brown spots with concentric zones of necrotic tissue, which first appear on the under side of the leaves as diffuse, silvery-whitish spots bearing minute light-green dots. (3) Small spots, not over 1·5 mm. in diameter, chiefly found on the seedlings, first of an intense green colour, later growing lighter and turning brown, rounded, frequently confluent, convex on the upper side or with a narrow raised margin, and usually crowded at the apical portion of the leaf. (4) White or creamy, rounded or angular, usually isolated spots, from 0·2 to 3·5 mm. in diameter, with a narrow, dark, raised margin, dispersed over the whole leaf or occasionally grouped on one longitudinal half, and often perforated owing to the breaking away of the affected tissue. This form appeared to be most frequent on plants exposed to direct sunlight. (5) Rounded or irregular, frequently lobate, white to brown spots, from 1·5 to 8 mm. in diameter, with a narrow, dark, raised margin; rather rare. (6) Irregularly angular, brown, usually isolated spots, 0·5 to 6 mm. in diameter, with a central

white fleck and a dark, raised margin; this type was only observed in small quantity on a local variety. Form (4) was occasionally found associated with *Ascochyta nicotianae* [ibid., ix, p. 227], and the spots of forms (5) and (6) frequently bore later in the season pycnidia of an undetermined species of *Phyllosticta*, differing from *P. tabaci* [loc. cit.] in the size of its spores. The relationship of this organism to the disease is being investigated. No great variations were observed in the susceptibility of the tobacco varieties cultivated in the region to 'ryaboukha', but healthy individual plants were often found growing among heavily infected ones, a fact which would indicate the possibility of developing resistant strains by selection.

Among the other diseases described the following may be mentioned: A severe seedling blight, associated with leaf-spotting, which developed in the seed-beds under glass of an important nursery during a prolonged spell of foggy and drizzling weather; although the cause of the blight was not established, it is believed to have been of bacterial origin. Some varieties suffered heavily from a bacterial disease locally known under the name 'dikyi ogon' [wildfire], characterized by the appearance on the under side of the leaves of indistinct, whitish spots, on which later develop minute, oily, green flecks which increase in size, run together, and finally form continuous spots between the veins, usually extending on both sides of the midrib, but not reaching the margin of the leaf. Later the affected tissue dries up and falls out. In one locality tobacco seedlings were severely attacked by *Botrytis cinerea*, which caused a stem rot near the collar. This fungus was also found on the flowers and seed pods of tobacco plants, which were rotted by it [cf. ibid., vii, p. 547]. Tobacco mosaic was observed in one plantation; the symptoms of the disease were greatly intensified in September, after a heavy rainfall.

VZOROFF (V. I.). Инфекционная рябуха Табака (**Nicotiana tabacum**). [Infectious 'ryaboukha' of Tobacco (*Nicotiana tabacum*).]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6-7, pp. 261-272, 1 pl., 1930. [German summary. Received June, 1931.]

This is a detailed account of the author's investigation of Mme Kvashnina's form (2) of bacterial 'ryaboukha' of tobacco (*Nicotiana tabacum*) in North Caucasus [see preceding abstract]. The disease is stated to be very prevalent on the recently introduced, higher grade tobacco varieties, e.g., Trebizond 519, while the local coarser varieties appear to be highly resistant to, or even immune from it. In its macroscopical symptoms, as well as in the cultural characters and polyphagous nature of the causal organism (which was easily isolated both from living and desiccated infected leaves) the disease appears to be closely related to the Wisconsin leaf spot (*Phytomonas mellea*) [*Bacterium melleum*: *R.A.M.*, x, p. 133], but since the local organism differs markedly in its biochemical reactions and in its capacity of producing a wide range of strikingly different variants [a few details of which are given] in pure culture, it is considered to be a species new to science and is named *P. heterocea*.

The organism is a straight, occasionally slightly bent, Gram-negative, non-capsulate, motile rod with rounded ends, occurring singly, and measuring 1 to 2 by 0·4 to 0·6 μ. At the end of 48 hours on agar it forms round, convex, smooth-margined, semi-transparent, glistening, light yellow (later amber-coloured) colonies about 2 mm. in diameter, with a pitted surface and a large granule in the middle; it slowly liquefies gelatine but not coagulated blood serum; it does not coagulate milk or form indol but produces ammonia and sulphuretted hydrogen. It reduces nitrates to nitrites; does not hydrolyse either urea or starch; ferments glucose, saccharose, maltose, galactose, arabinose, xylose, salicin, glycerine, and mannite, with production of acids; does not break down lactose, dextrin, inulin, ethyl alcohol, esculin, adonit, or dulcit; and turns Barsiekow's media alkaline. At first it acidifies litmus milk whey but later frequently turns it alkaline. Ammonium salts are utilized. Its optimum temperature for growth is between 25° and 30° C., and it is very resistant to desiccation. Its pathogenicity to tobacco was proved by inoculation experiments without wounding the host leaves.

Tobacco seeds from infected plants were shown to carry the organism, and should therefore be disinfected when introduced into new areas; for this purpose the author recommends steeping the seed in a solution of chloride of lime at a concentration of 10 to 30 mgm. active chlorine to 1 l. water. Field observations would, however, indicate that the chief source of infection is the soil, in which the organism was found to be widespread, and from which it is transferred to tobacco leaves by the wind and by splashing rain water. This is confirmed by the observation that in nature the bacterium usually gains entry into the host tissues through the stomata on the lower side of the leaves.

BÖNING (K.). **Krankheiten, Schädlinge und Witterungsschäden am Tabak im Jahre 1930.** [Diseases, pests, and weather injuries of Tobacco in the year 1930.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, ix, 3, pp. 56–60, 1931.

The principal damage to tobacco seedlings in Bavaria during 1930 was caused by *Pythium de Baryanum*, the losses from which ranged from 20 to 50 per cent. of the seedlings. Wildfire [*Bacterium tabacum*: *R.A.M.*, x, p. 63] caused severe injury in a number of localities, especially in late plantings, the total loss from this source amounting to between 6 and 7 per cent. The preventive effects of three or four applications of Bordeaux mixture were noticeable.

GAINES (J. G.) & STEVENS (N. E.). **Downy mildew of Tobacco.**—*Plant Disease Reporter*, xv, 4, pp. 32–33, 40, 1 map, 1931. [Mimeographed.]

Attention is drawn to the occurrence, in the tobacco plant-beds of Louisiana and Georgia, of downy mildew (*Peronospora hyoscyami*), which has not been reported in the United States since 1921 [*R.A.M.*, i, p. 322]. During the last half of March and the first half of April, 1931, a very severe epidemic of the disease developed in seed-beds of Perique tobacco in St. James Parish,

Louisiana, killing a high percentage of the plants in some cases. In Georgia, where infection was at the time of writing (24th April) scattered over 13 counties (the distribution of which is shown by means of a map), a small area of diseased plants was first observed on 4th April and within a week the entire bed was involved. On 15th, 16th, and 17th of the same month the disease appeared almost simultaneously in a number of beds in at least six different counties, and by 24th April 40 beds were found showing some evidence of mildew. The course of the present epidemic bears some resemblance to that of 1921, the actual commercial loss from which ultimately proved to be slight.

LEHMAN (S. G.), FLOYD (E. Y.), GRATZ (L. O.), GAINES (J. G.), & EDGERTON (C. W.). **Tobacco downy mildew.**—*Plant Disease Reporter*, xv, 5, pp. 43–45, 1 map, 1931. [Mimeographed.]

The first case of downy mildew of tobacco [*Peronospora hyoscyami*: see preceding abstract] in North Carolina was observed on 1st May, 1931. Although the disease spread rapidly over 16 counties, very few, if any, plants have been killed. On 21st May, recent infections were found in Stokes County, Piedmont, North Carolina, within three miles of the Virginia line. The disease was found in three seed-beds, several miles apart, in Gadsden County, Florida, on 8th and 9th May, but no commercial loss resulted. On 19th May about 80 per cent. of the plants (of the 94 and Round Tip types) in a 13-acre shade were found to show considerable spotting of the leaves. Since the last report from Georgia, downy mildew has appeared in many tobacco fields scattered over 11 counties, and has also been found in plant beds in 19 counties. So far, however, the injury from this cause has been very slight. By 4th May the disease had practically disappeared from St. James Parish, Louisiana.

VAN DER MEER (JIKKE H. H.). **Maatregelen ter voorkoming eener ernstige aantasting der Tomaten door de schimmel Cladosporium fulvum Cke ('meeldauw').** [Measures for the prevention of a serious attack on Tomatoes by the fungus *Cladosporium fulvum* Cke ('mildew').]—*Tijdschr. over Plantenziekten*, xxxvii, 4, pp. 69–90, 1 diag., 1 graph, 1931. [English summary.]

After recapitulating the principal results of Small's experiments on the influence of temperature and atmospheric humidity on the development of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, ix, pp. 566, 748], the author discusses the application of cultural measures calculated to produce conditions unfavourable to the germination and growth of the fungus. The chief objects in view are the maintenance of a low temperature (preferably below 22° C.) and an atmospheric humidity not exceeding 70 per cent. for 22° or 75 per cent. for 18°.

During the period from October, 1929, to January, 1930, the action of formaldehyde vapour and sulphur dioxide on the spores of *C. fulvum* was investigated under greenhouse conditions. Open Petri dishes, each containing two leaf fragments bearing the fructifications of the fungus, were placed at nine different spots at

varying heights. The formaldehyde gas was obtained by adding a 40 per cent. solution to potassium permanganate or by heating formaldehyde tablets. Sulphur dioxide was produced by burning sulphur. The spores from each leaf fragment were tested for germination on cornmeal agar at $\pm 22°$ after treatment. It was found that the following minimal quantities of the gases per cu. m. are required to destroy the spores: 1 c.c. 40 per cent. formaldehyde solution and 0·5 gm. potassium permanganate (greenhouse closed for 24 hours); 0·77 formaldehyde tablet (greenhouse closed for 24 hours); 2·5 gm. sulphur (greenhouse closed for about 20 minutes). Sulphur being the cheapest of these two disinfectants, experiments were conducted on a larger scale in two greenhouses at Naaldwijk (Holland), each of 600 cu. m. capacity. All the spores of *C. fulvum* were destroyed in about two hours by burning 6 kg. sulphur, divided into three heaps. In practice, therefore, 10 gm. sulphur per cu. m. was necessary, whereas in the laboratory greenhouses 2·5 gm. per cu. m. sufficed.

BOHNEN. **Solbar, ein Vorbeugungsmittel gegen die Braunfleckenkrankheit der Tomaten.** [Solbar, a preventive against Tomato leaf mould.]—*Ratschläge für Haus, Garten, Feld*, vi, 4, p. 46, 1 fig., 1931.

Excellent results are stated to have been obtained in the control of tomato leaf mould [*Cladosporium fulvum*: see preceding abstract] in the Hamburg district by three applications of solbar. The same preparation, used at the strength of 1 per cent. in combination with uspulun (25 gm. per 10 l. of solution), also proved very effective against canker [*Didymella lycopersici*: *R.A.M.*, ix, p. 276].

FRÖHLICH (J.). **Die wichtigsten Krankheiten der Bäume und Fehler des Holzes im südosteuropäischen Urwalde.** [The principal diseases of trees and defects of timber in the primeval forests of south-eastern Europe.]—*Forstwissensch. Centralbl.*, liii, 8, pp. 277–285, 5 figs., 1931.

Stem cankers or witches' brooms of spruce trees, caused by *Aecidium elatinum* [*R.A.M.*, ix, p. 602], are stated to be of frequent occurrence both in the pure stands of Asia Minor and the mixed conifer and beech forests of Bosnia and the Carpathians. The damage from this source may be considerable, amounting to 2 or 3 per cent. of the rejected wood.

Firs and pines, especially the former, are liable to severe injury by *Trametes pini* [ibid., x, p. 354], which may render 10 to 20 per cent. of the stand unfit for commercial purposes. Infection is particularly heavy on fir trees growing between spruce and beeches. Diseased trees may live to a great age because the outer rings and the sapwood remain healthy.

One of the most devastating diseases of the primeval forest is that caused by *Polyporus* [*Fomes*] *annosus*, the causal organism of stem-, root-, or red-rot [loc. cit.]. Infection occurs chiefly on 200- to 300-year-old fir and spruce trees. The damage varies considerably in different regions and soil types, the loss of merchantable timber ranging from a trace to 10 or 20 per cent. of the

stand. The fungus was observed to be very prevalent in north-west Anatolia, where the losses are primarily due to this cause, and also on trias lime in Bosnia.

P. [*F.*] *fomentarius* is widely distributed in the forests of south-eastern Europe on old beeches [ibid., x, p. 350], but as it chiefly attacks trees unsuitable for commercial use on account of 'brown' or 'false heart', the damage caused by this organism is relatively insignificant.

Agaricus melleus [*Armillaria mellea*: ibid., x, p. 354], an important parasite in the cultivated forest, is stated to cause little or no damage in the primeval state.

BAGCHEE (K. D.). **Problems of forest mycology and pathology in India.**—*Indian Forester*, lvii, 4, pp. 166–179, 1931.

After a brief introductory survey of the mycological and phyto-pathological investigations on silvicultural problems carried out in India from 1876 onwards, the writer briefly outlines some important phases of the work which are now receiving attention. These include studies on the parasitic rusts and root rots of forest trees, wood-rotting fungi, cankers, and agents of leaf fall.

A bibliography is given comprising 66 titles of books and papers containing references to forest mycology and pathology in India.

L. (D. H.). **Some diseases of Elm trees.**—*Missouri Bot. Gard. Bull.*, xix, 4, pp. 61–69, 2 pl., 1931.

Popular notes are given on the occurrence in the United States of the elm diseases caused by *Graphium ulmi*, *Verticillium* [*albo-atrum*: see next abstract], *Nectria cinnabarina* [*R.A.M.*, x, p. 348], *Collybia velutipes* [ibid., viii, p. 413], and *Gnomonia ulmea* [ibid., ix, p. 351]. The role of insects in the transmission of fungous diseases is briefly outlined, and a few general rules are given for maintaining the trees in good health.

MAY (C.) & GRAVATT (G. F.). **The Dutch Elm disease.**—*U.S. Dept. of Agric. Circ.* 170, 10 pp., 6 figs., 1931.

Further details are given concerning the symptoms, method of spread, and etiology of the Dutch elm disease (*Graphium ulmi*) in Ohio [*R.A.M.*, x, p. 67]. The bark beetle *Scolytus scolytus*, which acts as a carrier of the disease in Europe [ibid., x, p. 565], has not been found in America, but some native insect may, perhaps, convey infection. The manner in which *G. ulmi* was introduced into the United States is unknown. Since 1st June, 1919, the importation of elm nursery stock has been restricted and at the present time no further permits are being issued on account of the possibility of introducing fresh cases of the disease. No imported elms have come to the Ohio region since the disease was first discovered in the Netherlands.

In the writers' cultures of *G. ulmi* on potato-dextrose agar the piriform, *Cephalosporium*-like spores formed in the creeping mycelium ranged from 3 to 7 by 1·5 to 4 μ. The black stalks of the coremia (which were not always developed) measured up to

1,200 μ in length by 120 μ in thickness and the hyaline spores borne at their tips about 3·2 by 1·7 μ.

Attention is drawn to the difficulty of distinguishing the Dutch elm disease from that caused by *Verticillium* [*albo-atrum*: ibid., ix, p. 6] except by laboratory cultures. In one case at Cleveland both fungi were found to be present in the same tree. The twig blight of elms, caused by *Sphaeropsis ulmicola* [ibid., ix, p. 499], is reported to be very serious in Wisconsin. Affected twigs show definitely cankered and killed areas in the bark, accompanied by short, continuous, darkened streaks in the wood. For a number of years elms in some parts of the Ohio and upper Mississippi Valleys have been dying off as a result of a disease resembling the Dutch one except for the absence of streaks and spotting in the sapwood.

SIBILIA (C.). **La moria degli Olmi prodotta da Graphium ulmi Schwarz.** [Die-back of Elms produced by *Graphium ulmi* Schwarz.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, pp. 311–325, 5 figs., 1930.

The Dutch elm disease caused by *Graphium ulmi* [see preceding abstract] produces exactly the same symptoms in Italy, where it was recently reported for the first time [*R.A.M.*, x, p. 213], as it does in Holland, only that no liquid exudate has been observed yet in the former country and that the period of heaviest infection there is June.

Slight morphological differences were observed between cultures of the Dutch and Italian strains, especially in the coremia, which in the former reached 1,200 by 120 μ whereas in the latter they did not exceed 620 by 46 μ. The head measured up to 190 μ in diameter. Coremial formation was obtained not only on freshly cut elm twigs inoculated with the fungus but also, though less freely, on oak and *Crataegus* twigs.

The physiological behaviour of the Italian strain is described and there is a bibliography of nearly 50 titles.

GREGOR (née WILSON) (MARY J. F.). **A comparative study of growth-forms within the species Dermatea livida (B. et Br.), Phillips.**—*Ann. of Botany*, xlv, 177, pp. 73–90, 2 pl., 5 figs., 1931.

An account is given of a study made of the growth forms of a number of fungi that have been recorded as different species of the genus *Dermatea*, as found on the bark of conifers, the comparison between the forms being based on cultural characters and a biometric study of spore size. They were also compared, where possible, with the type specimens. The previously recognized species *D. livida*, *D. eucrita*, *D. laricicola*, *D. abietina*, and *D. pini*, were found to occupy various positions in one continuous series of forms, and are therefore united by the author under the oldest specific name, *D. livida* (B. et Br.) Phillips. The more recent names should, in the author's opinion, be regarded as synonyms.

The conidial stage of *D. livida* was identified as *Myxosporium abietinum*; in addition to the large conidia described by Rostrup,

minute non-germinating 'B' spores were found, the length of which varied slightly in the different forms.

Investigation of the development of the conidial stage in culture showed that a true pycnidium is initially produced, the upper wall of which breaks down, leaving a saucer-shaped structure containing spores; indications were noted of a similar condition in nature.

All attempts at artificial infection upon all the recorded hosts gave negative results, but field observations suggested that certain forms with small ascospores may occasionally function as weak secondary parasites.

A bibliography of over 30 titles is appended.

DODGE (B. O.). **A destructive Red-Cedar rust disease.**—*Journ. New York Bot. Gard.*, xxxii, 377, pp. 101–108, 3 pl., 1931.

Attention is drawn to the destructive effects of *Gymnosporangium nidus-avis* on the red cedar (*Juniperus virginiana*) in New York and Virginia [cf. *R.A.M.*, x, p. 391]. Ten years ago the effuse type of infection by this fungus was very prevalent in the Arlington National Cemetery, limbs up to 6 in. in diameter being roughly scarred for several feet, and now nearly every tree still standing exhibits more than one serious trunk and limb infection. An inoculation experiment showed that infection spreads at least six inches vertically in both directions and completely round the stem during the first three years. The most destructive type of infection is that represented by long, parallel, closely set ridges up and down the tree. The infection of large numbers of branches results in the formation of witches' brooms all over the tree and consequent serious damage. The natural alternate hosts of *G. nidus-avis* are *Amelanchier* spp. but the writer and others have proved conclusively that apple is also susceptible.

TUBEUF [C. v.]. **Auskunft über Douglasienkrankheiten.** [Information on Douglas Fir diseases.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 5, pp. 253–254, 1931.

The only locality in Germany in which the occurrence of *Rhabdocline pseudotsugae* on Douglas fir [*Pseudotsuga taxifolia*] has been definitely established is Gadow (Mark Brandenburg) [*R.A.M.*, x, p. 2], the second report of the disease having proved erroneous.

A report has been received of the occurrence of *Adelopus balsamicola* [ibid., x, p. 145] causing defoliation of *P. taxifolia* in the Plön district of Slesvig-Holstein.

LEPIK (E.). **Männi pudetõbi, Lophodermium pinastri.** [Leaf fall of Pines, *Lophodermium pinastri*.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu (Estland)* 6, pp. 10–12, 1 fig., 1931. [Esthonian, with German summary.]

The exceptionally mild winter of 1929–30 provided ideal conditions for the development of the causal organism of leaf fall of pines (*Lophodermium pinastri*) in Esthonia [*R.A.M.*, x, p. 280],

where the seedlings were found in the spring to have been destroyed in immense numbers. About a quarter of all the pine seedlings in the Sagedi (Virumaa) silvicultural district were killed by *Thelephora terrestris*.

LEPIK (E.). **Puumädanikest ja puukaitsest.** [Wood rots and protection of wood.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu (Estland)* 6, pp. 1–10, 4 figs., 1 graph, 1931. [Esthonian, with German summary.]

The information in this paper on the etiology and control of the fungous decay of timber in Esthonia has already been summarized from another source [*R.A.M.*, x, p. 421].

REINKING (O. A.) & HUMPHREY (C. J.). **Laboratory tests on the durability of Philippine woods against fungi.**—*Philipp. Journ. of Sci.*, xlv, 1, pp. 77–91, 2 pl., 1931.

Fifteen kinds of common Philippine woods were tested for their resistance to decay caused by *Daedalea flavida*, *Polyporus* [*Polystictus*] *sanguineus* [*R.A.M.*, x, p. 71], *Trametes versatilis*, *T. meyenii*, *Xerotus nigrita*, and nine other undetermined destructive fungi occurring in the Philippines. Small blocks of wood were placed in Erlenmeyer flasks, inoculated, and allowed to decay for periods up to 28 months, usually 16 or 17 months. The degree of rotting was indicated by loss in weight as well as by the physical condition of the wood on removal of the flasks. The data [which are tabulated] on the relative durability of the woods agree well with the published records of the resistance of the same species to fungous infection under natural or service conditions. The most durable woods were found to be *Vitex parviflora*, *Hopea plagata*, *Isoptera borneensis*, *Shorea balangeran*, and *Pahudia rhomboidea*. *Pterocarpus indicus*, *P. vidalianus*, *Dipterocarpus grandiflorus*, and *D. verniciflluus* were also moderately resistant to the fungi used in the tests.

BARTON-WRIGHT (E. C.) & BOSWELL (J. G.). **The biochemistry of dry-rot in wood. II. An investigation of the products of decay of Spruce wood rotted by Merulius lachrymans.**—*Biochem. Journ.*, xxv, 2, pp. 494–506, 1931.

Continuing their investigations on the action of the dry rot fungus (*Merulius lacrymans*) on Norway spruce [*Picea excelsa*] wood [*R.A.M.*, viii, p. 476], the writers found that the organism first removes the readily hydrolysable fractions, mannan and galactan, and then attacks the cellulose, the latter being converted into glucose and consumed in this form. A small residue of oxycellulose is left.

A homogeneous lignin body was extracted with alcohol from the decayed wood; its molecular composition was $C_{44}H_{50}O_{16}$, the extended formula being $(OCH_3)_2.C_{41}H_{39}O_9(OH)_4.CHO$. From its reactions this substance appears to be similar to the lignins isolated from woody tissues by the action of caustic alkalis under pressure. The hemicellulose fractions of spruce wood are not

affected by the fungus. An unknown uronic acid (possibly penturonic) was isolated from the hemicellulose A fraction. There was found to be little or no delignification of the wood as a result of infection by *M. lacrymans*, but marked oxidation had occurred.

DALVI (P. D.). **Biochemistry of tan-liquor fermentation.**—*Journ. Indian Inst. Sci.*, xiii A, 15, pp. 173–192, 1930.

In the course of an investigation on the microflora of tan-liquors from various sources carried out at the Indian Institute of Science, Bangalore, 17 different strains of fungi were isolated, viz., *Aspergillus niger*, *A. flavus*, *A. spinulosum*, *A. oryzae*, *A. candidus*, *A. nidulans*, *Penicillium glaucum*, *P. brevicaule*, *P. oxalicum*, *P. camemberti*, *P. claviforme*, *P. granulatum*, an unidentified *Penicillium*, *Mucor racemosus*, *M. mucedo*, *M. rouxii*, and *Rhizopus nigricans*. *A. niger*, *P. glaucum*, and the unidentified *Penicillium* were found to develop well even in the presence of 10 per cent. tannic acid [cf. *R.A.M.*, ix, p. 799]. *M. rouxii* grew fairly well in 2·5 per cent. tannic acid, while the remaining fungi developed only in solutions containing under 2·5 per cent.

A preparation of tannase was obtained from the mycelium of *A. niger* growing on myrobalan [*Terminalia* sp.] and its properties studied. The purified enzyme gave none of the commoner protein reactions. It was associated with a small amount of diastase which did not, however, interfere with its action on tannic acid. The mould powder and the precipitated dry enzyme retained their activity almost indefinitely. The solution was not stable at high temperatures but maintained its activity for lengthy periods at 0°C. in the presence of toluene. The optimum temperature for the hydrolysis of tannic acid by the tannase was about 60°. The action of the enzyme was retarded by a reaction corresponding to P_H 2·3 and favoured by one of P_H 5·15. The rate of hydrolysis increased with the concentration of the enzyme but decreased with that of the substratum and was retarded by increasing amounts of gallic acid.

Under tropical conditions the loss of tannic acid in vegetable tan-liquors and their consequent deterioration due to fermentation may amount to as much as 30 per cent. Tests were accordingly made to determine the efficacy of various preservative substances in checking the development of tannase by *A. niger*, *A. luchuensis*, and *P. glaucum* in tannic acid solutions at 30°. Thymol and camphor proved highly efficacious for this purpose even in minute quantities (0·15 and 0·2 gm. per 25 c.c. tannic acid in the former case and 0·2 and 0·4 gm. in the latter). The hydrolysis of tannic acid may also be arrested by the addition to the solution of gallic acid or of minute quantities of sulphur, as well as by the adjustment of the hydrogen-ion concentration to P_H 2·0.

GILL (G. A.). **Plant diseases of the vegetable garden.**—*S. Africa Dept. of Agric. Bull.* 84, pp. 21–29, 1930.

Brief notes are given on some of the more important diseases of vegetables found in the South African Karroo, with directions for their control.

KIKOINA (Mme R.). О работе лаборатории по изучению хранения овощей. [Note on the work of the laboratory for the investigation of storage of vegetables.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, pp. 287–288, 1930. [Received June, 1931.]

Following numerous complaints of serious wastage of market garden produce and root crops during storage in North Caucasus, a preliminary investigation in 1930 showed that the losses were chiefly caused by the defective conditions under which most of the vegetables were stored. The most important economically were the storage diseases caused by *Sclerotinia libertiana* [*S. sclerotiorum*] on carrots and parsnips, a grey rot (*Botrytis* sp.) of onions, *Fusarium solani* on potatoes, and a bacterial rot of beets.

Field observations in the same year indicated that the most prevalent diseases of vegetable crops in North Caucasus are *Septoria lycopersici* on tomato, *Macrosporium* sp. on chilli [*Capsicum annuum*], *Cercospora beticola* on beet, *Alternaria brassicae* on cabbage, *Macrosporium commune* [*M.* (?) *sarcinula*: *R.A.M.*, x, p. 430] on onion, and *M.* [*Alternaria*] *solani* and *Verticillium albo-atrum* on potatoes.

FINDLAY (W. M.). **A disease-resisting Turnip.**—*Scottish Journ. of Agric.*, xiv, 2, pp. 173–183, 1 pl., 1931.

Notes are given on the origin and characteristics of the Bruce Purple Top Yellow turnip, which has maintained a high degree of resistance to finger-and-toe disease [*Plasmodiophora brassicae*] in the north of Scotland for many years. Some local synonyms of the Bruce variety (which is believed to have been introduced into Aberdeenshire nearly a hundred years ago) are Skene Purple Top, Geordie Henry, Tammie Mackie, Sandy Robb, Bulwark Champion, Canker Resister, and Newhall, Russell's, Black, or Red Neep. During each of the five years in which it has been sown in infected plots at Craibstone which have borne turnips continuously for the last 16 years, the Bruce has been superior in resistance to all the other varieties. Infection is almost entirely confined to the roots, leaving the bulbs healthy, so that practically the whole crop can be utilized.

GIBBS (J. G.). **Dissemination of club-root in the dung of farm stock.**—*New Zealand Journ. of Agric.*, xlii, 3, pp. 193–198, 2 figs., 1931.

A few details are given of a small series of experiments at Palmerston North, New Zealand, which showed that the spores of the finger-and-toe organism (*Plasmodiophora brassicae*) retain their viability during passage through the digestive tract of sheep and cattle. In addition, it was shown that the spores remain viable in fresh cattle droppings for at least fifteen weeks, this revealing a method of dissemination of the disease not hitherto considered in New Zealand. Besides the precautions recommended in a previous paper [*R.A.M.*, x, p. 574], and in view of the fact that the spores are known to remain alive in the soil for some years, it is therefore advised that farmers should select the ground for cruciferous crops three years in advance of sowing, and during

this period should avoid turning live stock into these fields within one week of their last feed on infected fodder.

LOBIK (V. I.). К вопросу о болезнях Сои по наблюдениям в **1930** году в Ессентуках. [The problem of the diseases of the Soy-bean in the light of observations in 1930 at Essentuki.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, *1930*, 6–7, p. 285, 1930. [Received June, 1931.]

The author states that next to bacterial leaf spots, the economically most important disease of soy-beans in the neighbourhood of Essentuki [North Caucasus] in 1930 was a wilt caused by an undetermined species of *Fusarium*. The affected plants stood out conspicuously among the healthy ones by their yellow colour; usually the whole plant died, but not infrequently only the main stem was killed, while lateral shoots continued to develop apparently normally. Macroscopically no parasitic organism could be noticed in the diseased plants, but when dead stems were placed in the laboratory under moist conditions, they became covered by the second day with a delicate mycelial weft bearing characteristic *Fusarium* fructifications. Seedlings raised from healthy soy-beans which were inoculated with pure cultures of the *Fusarium* at first developed normally but after a short time succumbed to symptoms similar to those observed in nature, while the controls remained healthy.

Downy mildew (*Peronospora manshurica*) [*R.A.M.*, ix, p. 228; x, p. 83] was found in 1930 on soy-bean varieties introduced from the Asiatic Far East, and a species of *Botrytis* was found attacking the variety Krushulya.

OGILVIE (L.) & MULLIGAN (B. O.). **White tip disease of Leeks.**—*Gard. Chron.*, lxxxix, 2315, p. 360, 1931.

Considerable losses have been caused in the Cheltenham district by the white tip disease of leeks (*Phytophthora* sp.) originally reported from Edinburgh [*R.A.M.*, viii, p. 543]. Infection is also stated to be prevalent round Bristol and probably elsewhere in the south-west of England. None of the 17 varieties tested in April, 1930, showed any considerable difference in their reaction to the fungus. Good control of the disease was obtained by dusting with copper-lime dust (20–80), at the rate of about 2 oz. per sq. yd., on 23rd October, 26th November, and 15th December.

PRASAD (H. H.). **A note on bacterial leaf spot of Khira (Cucumis sativus).**—*Indian Journ. Agric. Sci.*, i, 2, pp. 289–290, 1 col. pl., 1931.

In July, 1930, some cucumber plants sown in February to March and grown under irrigation in and near Pusa, India, during the hot weather were found to bear numerous spots, surrounded by a bright yellow halo, on the leaves. Two or more spots sometimes unite to form circular or angular, brown areas. On the lower surface the spots were thin, brown, and water soaked. In places there were large areas of dead tissue.

The organism isolated from the diseased material and inoculated into healthy plants with positive results was a bacterium, occurring

singly, in pairs, or in short chains, 0·5 to 0·7 by 0·7 to 1·5 μ, Gram-negative, forming convex, round, yellow colonies with internal concentric markings on ordinary agar, liquefying gelatine slowly, exerting a strong diastatic action on potato, slowly coagulating milk, reducing litmus, and making moderate growth in Uschinsky's solution. These characters agree in the main with those of *Bacterium cucurbitae* [*R.A.M.*, ix, p. 576].

BOURIQUET (G.). **La 'rosette' de l'Arachide à Madagascar.** [Groundnut rosette disease in Madagascar.]—*Agron. Colon.*, xx, 160, pp. 105–108, 1931.

The author states that a serious disease of groundnuts, the symptoms of which are indistinguishable from those of the rosette disease of this crop in Africa [*R.A.M.*, ix, p. 20], was first officially reported from the Tananarive district of Madagascar in February, 1930, since when it has also been found in two other districts of that island, the indications being that it had been present for some years. The diseased plants were colonized by an undetermined black aphid, the capacity of which to transmit the disease is being tested. No significant variations in degree of susceptibility were observed in the varieties of groundnut grown in Madagascar, but early sown crops appeared to suffer less from the disease than the later sowings. Although the disease is not known to be carried by the seed, it is recommended to use seed from healthy plants, since there is some evidence that plants raised from such seed are more resistant to rosette, owing to their greater vigour.

JOLY (R. L.). **Les conséquences de la mosaïque du Manioc.** [The effects of Cassava mosaic.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xi, 114, pp. 99–104, 1931.

Mosaic disease of cassava [*R.A.M.*, ix, p. 19; see also ix, p. 765; x, p. 165] is stated to be still rapidly spreading in the Cameroons and along the upper reaches of the Ubangui, where in the few years since this plant was introduced the disease has made enormous strides. Observations made in numerous localities differing in soil and climate indicated that *Manihot utilissima* is more resistant than *M. dulcis*, but only during the early stages of vegetation. It is not until the leaf is fully grown that it develops mosaic and shows the presence of secondary fungi; one and the same plant frequently bears young greenish-violet leaves, apparently healthy older leaves, and mosaic leaves. These last show a mosaic pattern of yellowish and green patches and the surface bulges on the upper side, forming on the under side corresponding small pockets which become invaded by fungal mycelium; finally, the leaf curls up, withers, and falls, the whole process occupying only a few days.

Examination of mosaic leaves showed that the petioles and leaf bases bore isolated or more often gregarious erumpent black spots formed by a fungus, while the tissues were invaded by a brown mycelium which destroyed the parenchymatous cells. The black spots were formed by a dense stroma which developed into thick-walled perithecia. This fungus appeared to be an undescribed species

of *Guignardia*. Some leaves showed the presence of a *Gloeosporium*, probably *G. manihotis* [ibid., vii, p. 15].

The disease is present in all seasons and types of weather and on all soils, and was equally prevalent in all the localities visited.

The only means of control suggested is to encourage the natives to use seed instead of cuttings.

HARRIS (W.) & SMITH (F. E. V.). **Grape vine culture.**—Pamphlet issued by *Jamaica Agric. Soc.*, 17 pp., 1930. [Received July, 1931.]

In the part of this pamphlet dealing with the troubles that affect the grape vine in Jamaica, Smith gives a brief, popular account of the symptoms and control of the following diseases, namely, anthracnose (*Gloeosporium ampelophagum*), black rot (*Guignardia bidwellii*) [*R.A.M.*, x, p. 503], powdery mildew (*Uncinula necator*), downy mildew (*Plasmopara viticola*), which is stated to be by far the most common disease in the island, rattles or shelling (dropping off of the grapes as they begin to ripen), and shanking (breaking away of the grapes at the point where the stalk joins the fruit). The last two troubles are stated to be of physiological origin.

RAVAZ (L.). **La concentration de la sève, la coulure et les maladies cryptogamiques.** [Concentration of the sap, 'coulure', and cryptogamic diseases.]—*Prog. Agric. et Vitic.*, xcv, 10, pp. 222–226, 1931.

In this paper the author adduces evidence to show that in the vine, as in other plants, 'coulure' [i.e. failure of the flowers to set: *R.A.M.*, x, p. 291] is favoured by a low concentration of the sap, which, in its turn, is caused by too rapid a growth of the plant. Weakly, slow-growing vines also are usually less susceptible to fungal diseases, e.g. mildew [*Plasmopara viticola*], than vigorous ones. These observations lead him to suggest the possibility of heightening the resistance of the vines both to 'coulure' and fungal diseases by measures directed towards increasing the concentration of the plant sap, such as making circular incisions, 4 to 5 mm. wide, in the bark of the stems, tying ligatures around the stems, removing the growing points of the shoots, and the like, combined with applications of complete fertilizers with an excess of phosphoric acid, potash, and lime.

LEPIK (E.). **Anatomische Untersuchungen über die durch Plasmopara viticola erzeugten Subinfektionen.** [Anatomical investigations on the subinfections produced by *Plasmopara viticola*.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 5, pp. 228–240, 3 figs., 1 graph, 1931.

Infection of vine leaves by *Plasmopara viticola* generally occurs through the stomata on the under side, which are penetrated by the germ-tubes of the zoospores [*R.A.M.*, viii, p. 483]. No correlation was found, in the writer's examination of different vine varieties and hybrids at Wädenswil, Switzerland, between the number and size of the stomata and resistance or susceptibility to downy mildew [cf. ibid., i, p. 411]. In the early stages the hyphae

are apparently confined to the intercellular spaces where they cause little damage. Later haustoria are profusely formed in the cells of the leaves of susceptible varieties and there is an active growth of the fungus. In the case of subinfections, on the other hand, the hyphae are incapable of further development and perish together with the surrounding cells. In the leaf the hyphae become aggregated near the stomata, presumably owing to the need for oxygen. This phenomenon may be observed both in susceptible and resistant varieties, but conidial formation follows only in the former. No sign of starvation was apparent in the hyphae of subinfections, which were quite equal in diameter to those in heavily infected leaves or sometimes even thicker; the former, moreover, were not deficient in nuclei and haustoria of adequate size, but only in the capacity for further development.

[This paper is also printed as *Mitt. Phytopath. Versuchsstat. Univ. Tartu. in Estland* 8, 1931.]

LIPEZKAJA (A. D.). **Nachweis der überwinternden Oidiumformen (Oidium tuckeri) in den Weinbergen der Versuchsstation in Anapa (Nord-Kaukasus).** [Detection of the overwintering forms of Oidium (*Oidium tuckeri*) in the vineyards of the experiment station at Anapa (North Caucasus).]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 4, pp. 145–149, 2 figs., 1931.

The perithecia of *Uncinula spiralis* [*U. necator*] were detected by the writer for the first time at Anapa, North Caucasus, on the upper and under sides of Riesling vines on 4th October, 1930 [*R.A.M.*, iv, p. 395; ix, p. 12]. Subsequently they were also found in large numbers on the Cabernet-Sauvignon and Aligoté varieties and on the hybrids Couderc 28–112 and Seibel 1020 at a distance of 2 to 3 m. from the diseased Riesling stock. The affected plot was protected by a hedge from the south and west winds. Perithecia were also found on a Portuguese stock and others growing against the wall of the experiment station. None of the stocks had been treated against mildew, and in some cases 10 to 15 leaves of a single shoot bore perithecia, which also occurred on the petioles, pedicels, shoots, and buds.

On the leaves the perithecia are strewn over the entire surface, sometimes so densely clustered as to give the impression of a sooty covering. They are plainly visible to the naked eye on the leaves, but cannot be detected on the shoots and buds without the aid of a lens. On the shoots the perithecia occur chiefly at the nodes, while on the buds they are situated among the scales and hairs. The diameter of the ripe perithecia ranges from 75 to 105 μ; they are furnished with 8 to 17 septate appendages, 210 to 405 μ long by about 7 μ in width. The perithecia contain 2 to 4 oval asci, tapering somewhat at the base, 48 to 60 μ in length and 37 to 45 μ in diameter at the broadest part, occupied by six oval ascospores, 20 by 13 μ.

Until the first days of October, 1930, the weather was mild and fine, but by the 4th, when the perithecia were detected, the minimum night temperature had fallen to $-0{\cdot}2^{\circ}$ C. It would thus appear that the perithecial formation was accelerated by the cold,

but an experiment under controlled conditions showed that the development of these organs is possible at the relatively high temperature of 16° to 20°.

RAVAZ (L.). **Chronique. L'excoriose, &c.** [Current events: excoriosis, &c.]—*Prog. Agric. et Vitic.*, xcv, 12, pp. 269–273, 4 figs., 1931.

Following the report of an outbreak of excoriosis [*Phoma flaccida*] in a vineyard in the department of Gard [south France], the author gives a very brief account of the disease and recapitulates the control measures recommended by him in a former paper [*R.A.M.*, x, p. 359]. In localities where the disease is prevalent susceptible varieties, such as Aramon, should be replaced by resistant ones, e.g., Piquepoul, Carignan, Terret, &c.

BÈNES (G.). **Contribution à l'étude sur le court-noué. Quelques rapprochements.** [Contribution to the study of 'court-noué'. Some comparisons.]—*Prog. Agric. et Vitic.*, xcv, 9, pp. 204–207, 1931.

The fact that court-noué of the vine [*R.A.M.*, x, p. 433] has never been found to occur on soil periodically receiving river silt deposits, supported by further observations [some details of which are given], leads the author to believe that one of the chief causes of the disease is the lack in the soil of one or more elements (the nature of which is not known) indispensable to the normal growth of the vine. Some evidence would indicate that the chief, if not the only, action of these elements is to prevent the soil from being infected with the disease.

BIFFEN (R. H.). **Annual Report for 1930 of the Botanist.**—*Journ. Roy. Agric. Soc. of England*, xci, pp. 326–332, 1930. [Received May, 1931.]

Notes are given on the prevalence of some common diseases of plants in England during 1930.

RIVERA (V.) & CORNELI (E.). **Rassegna dei casi fitopatologici osservati nel 1929 (danni da freddo e da crittogame).** [Survey of phytopathological records noted in 1929. (Injuries due to cold and fungi.)]—*Riv. Pat. Veg.*, xxi, 3–4, pp. 65–100, 2 pl., 1 fig., 1931.

Notes are given on a large number of plant diseases observed during 1929 in the vicinity of Perugia, special attention being paid to the effects of the abnormally cold weather which prevailed locally during the spring. Among the numerous records of fungal attack mention may be made of *Fusarium oxysporum* attacking potatoes [*R.A.M.*, viii, p. 486], and causing an early yellowing and wilt of the aerial parts with a consequent reduction in the number and size of the tubers. The fungus was found chiefly in the underground parts of the stems.

VOGLINO (P.). **I funghi più dannosi alle piante coltivate osservati nella Provincia di Torino e regioni vicine durante l'anno 1928.** [The fungi causing most damage to cultivated plants

observed in the Province of Turin and the neighbouring districts during the year 1928.]—*Ann. R. Accad. Agric. Torino*, lxxii, pp. 35–46, 1930. [Received June, 1931.]

Popular notes are given on some of the more important diseases of cultivated crops observed in the Province of Turin and the neighbouring districts in 1928, together with a survey of the meteorological conditions prevailing during the same period.

HYDE (A. M.). **The past year in agriculture.**—*Yearbook of Agric. 1931, U.S. Dept. of Agric.*, pp. 1–90, 1931.

This report contains the following amongst other items of phytopathological interest. In wheats resistant to stem rust [*Puccinia graminis*], the most serious disease of this crop in the United States, investigations in Minnesota have shown that the stomata remain closed in the morning until the dew, in which the spores germinate, has dried, so that there is no opportunity for the entry of the germ-tubes into the plants.

In the hope of eradicating mosaic disease of sugar-cane, over 100 primitive varieties and strains from the jungles of New Guinea have been planted out in southern Florida preparatory to crossing with the established commercial types [*R.A.M.*, viii, pp. 133, 667]. Among the introduced varieties is an erect, vigorous, highly productive species growing from 25 to 30 ft. high, which also appears to be resistant to disease. Most of the world supply of cane sugar is now derived from crosses between a small wild cane (*Saccharum spontaneum*) and cultivated varieties.

Over 70,000 trees, representing 162 selected strains of Asiatic chestnuts, were planted out during 1930 for the purpose of testing their resistance to blight [*Endothia parasitica*: ibid., x, p. 496] under widely varying conditions.

The campaign against citrus canker [*Pseudomonas citri*] has been so successful that no infection is now known to occur in any of the regions producing this crop commercially. An infection was found in 1930 in a nursery in Victoria County, Texas, where 5 grapefruit and 15,000 two-year-old *Citrus trifoliata* seedlings were destroyed as a control measure.

An eradication campaign against the phony peach disease [ibid., x, p. 323] has been instituted by the Bureau of Plant Industry in co-operation with the States of Georgia and Alabama. About 87,000 trees were found to be infected in Georgia, 600 in Alabama, and 140 in Mississippi. Slight infections were detected in Louisiana, Arkansas, and Tennessee, while recent inspections revealed cases in North and South Carolina.

A year's progress in solving farm problems of Illinois 1929–30. —*Forty-third Ann. Rept. Illinois Agric. Exper. Stat. for year ended June 30, 1930*, 296 pp., 35 figs., 9 diags., 9 graphs, 1930. [Received August, 1931.]

The following items of phytopathological interest, other than those already noticed from various sources, occur in this report. Further studies by B. Koehler, with the object of reducing the 7·5 per cent. annual loss in Illinois from ear rots of maize, have shown that at least five factors govern the amount of destructive

infection, viz., relative abundance of inoculum, atmospheric conditions, susceptibility of the variety of maize grown, ear covering, and ear injury. The relative importance of these factors varies with the different fungi concerned in the causation of the rots [*R.A.M.*, x, p. 180]. Thus, in the case of infection by *Diplodia zeae* during the summer months, abundance of inoculum seems to be the principal factor, while in that of *Fusarium* disease (*F. moniliforme*) [*Gibberella moniliformis*], susceptibility, ear covering, and ear injury are chiefly of importance, the inoculum apparently being plentiful at all times. From 1st of August (time of silking) until 30th September inoculations were made at ten-day intervals on a medium-smooth, horny strain of yellow Dent maize with spore suspensions of *D. zeae*, *G. moniliformis*, *G. saubinetii*, and *Basisporium gallarum* [*Nigrospora sphaerica*] at the following points: (1) on silk without disturbing husks, (2) on tip of ear through open husks, (3) beneath outer husks towards butt end of ear, (4) in shank about two inches from ear, (5) in leaf axil subtending shank, and (6) in stalk about one inch below shank bearing node. Data on 200 inoculated and 400 control ears during the past two years show that the inoculations with *D. zeae* were effective throughout the period and by all the methods used. The inoculations with *G. moniliformis* were very effective on the tip of the ears and slightly or not at all effective by the other methods. The most critical date for this fungus was 10th August. Silk inoculations with *G. saubinetii* were slightly effective on 10th August only, while positive results were given by those on the ear tips on 1st, 10th, and 20th. The *N. sphaerica* inocula were of two kinds, a pure culture strain and spores from rotted ears. The latter were more effective, but in all cases the percentage of ear rot produced under the conditions of the tests was low.

The disinfection (by B. Koehler and J. R. Holbert) of maize seed-grain artificially inoculated with *D. zeae*, *G. moniliformis*, *N. sphaerica*, and *Cephalosporium acremonium* gave increased yields in every case, the greatest difference occurring with the first-named and the slightest with the last [ibid., ix, p. 579].

H. W. Anderson has conducted experiments in the control of apple scab [*Venturia inaequalis*] by flotation sulphur (thylox and ferrox) [ibid., ix, p. 796], which promise to make effective substitutes for lime-sulphur and Bordeaux mixture, both liable to injure fruit and foliage. In one test the incidence of infection in a plot treated with ferrox (five applications) was 2·93 per cent., compared with 8·87, 3·51, 28·1, 52·6, and 94·9 for thylox, lime-sulphur, ground wettable sulphur, lead arsenate, and check, respectively. The omission of the third application (one week after petal fall) resulted in a distinct increase in the incidence of scab.

H. W. Anderson has also made a number of observations on varietal susceptibility to pear blight [*Bacillus amylovorus*: ibid., x, p. 602]. Extreme fluctuations with regard to leaf blight were noticed in the oriental pears alleged to be of one variety. Of over 100 trees of *Pyrus ussuriensis* tested, only 10 to 15 show sufficient resistance to *B. amylovorus* and winter injury to merit further consideration.

Experiments by H. W. Anderson on the control of peach diseases

showed that brown rot [*Sclerotinia americana*] was controlled by wettable sulphurs (preferably flotation) used at a minimum dilution of 6 lb. per 100 galls. water.

A. S. Colby found marked resistance to anthracnose [*Plectodiscella veneta*] in a high percentage of Quillen raspberry seedlings [ibid., viii, p. 293].

The treatment of gladiolus corms, before planting, with a mercury solution has been found valuable by F. F. Weinard and S. W. Decker in the control of scab [*Bacterium marginatum*: ibid., ix, p. 509], but this treatment appears to be less effective against hard rot [*Septoria gladioli*] and mould (*Penicillium*) [*gladioli*: ibid., ix, pp. 457, 624]. Important preventive measures include rapid curing and careful handling of the corms, together with the maintenance of a uniformly low temperature and moderate dryness during storage.

ADAMS (J. F.). **Report of the Plant Pathologist for 1930.**—*Quart. Bull. State Board of Agric., Delaware*, xxi, 1, 22 pp., 4 figs., 1931.

In this report, which is on the same lines as those previously issued [*R.A.M.*, ix, p. 580], popular notes are given on numerous diseases of plants observed in Delaware during 1930. Light rainfall during the growing period (7·69 in. during April, May, and June, which was 4·41 in. less than in the corresponding period in 1929) allowed spray applications to exert their maximum efficiency against the apple scab fungus (*Venturia inaequalis*). Examination of overwintered apple leaves showed that on 13th March 3 per cent. of the spores were mature, while by 27th March all were mature. The first leaf infection was observed on 30th April and the first fruit infection on 15th May. Owing to the exceptionally dry season the commercial lime-sulphur spray gave better control than copper sprays on susceptible apple varieties, but if the weather favours infection, or with susceptible varieties, the quantity commercially recommended must be increased by 50 to 100 per cent.

Black rot of apples (*Physalospora malorum*) [*P. cydoniae*] while more prevalent than in 1929, did not cause any serious defoliation. Fruit infection was much more common than before and a new symptom was noted on young fruit soon after the petal fall stage, consisting in the development of small purplish specks, which gradually turned black, usually near the blossom end. Most of the spots showed a distinct delimitation by the breaking of the skin around the circular discoloured area. The spraying tests demonstrated that copper sprays give the best control.

TISDALE (W. B.). **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1930*, pp. 90–107, 1930. [Received July, 1931.]

In this report the following new hosts of the citrus canker organism (*Phytomonas* [*Pseudomonas*] *citri*) are recorded, as a result of successful inoculation experiments: *Balsamocitrus paniculata*, *Feronia lucida*, and *Feroniella obligata*. Strong evidence was obtained that chronic wilting and decline of citrus trees

[*R.A.M.*, viii, p. 158] is to a great extent caused either by deficient or excessive soil moisture or by combinations of these extremes; apparently, there is no remedy for the condition.

In tests for the control of downy mildew of cucumbers [*Pseudoperonospora cubensis*: ibid., ix, p. 437] the best results were given by copper-lime, copper carbonate, and copper stearate dusts and Bordeaux mixture; sulphur applications did not give successful control. On most of the plots the copper gave equally good results whether used in dust or liquid form.

When 73 two- and three-year selfed lines of maize grown in the field were inoculated with the brown spot fungus (*Physoderma zeae-maydis*) from 0 to 100 per cent. infection ensued; greenhouse tests indicated that resistance to the disease is inherited. A hypodermic infection of a sporangial suspension of the fungus into the apical bud tissues of the plants resulted in a higher percentage of infection than was produced by pouring the inoculum into the tops. On plants inoculated in the greenhouse the incubation period ranged from 11 to 25 days; no infection developed when the minimum temperature in the greenhouse was below 68° F.

In 1929 the more susceptible varieties of pecan [*Carya pecan*] were severely affected by scab (*Cladosporium effusum*) [ibid., viii, p. 549], while considerable damage also followed leaf infections by *Cercospora fusca*, *Cercosporella caryigenum*, *Mycosphaerella dendroides* [ibid., ix, p. 751] and, on nursery stock, *Phyllosticta caryae*. The leaf spot organisms were, however, controlled in all those orchards which were sprayed against *C. effusum*.

LEVINE (M.). **The chromosome-number in cancer tissue of man, of rodent, of bird and in crown gall tissue of plants.**—*Journ. Cancer Res.*, xiv, 3, pp. 400–425, 1930.

Young crown gall (*Bacterium tumefaciens*) tissue of beet was found to present a large number of actively dividing cells. Behind the periphery of the growth, large binucleate cells may be observed. Multinucleate cells are uncommon, but they do occur. Tetraploid cells are more numerous than octaploid, but those with the diploid number of chromosomes are the most common. In *Nicotiana glutinosa* (the leaf petioles of which responded rapidly to inoculation with the Smith-Townsend organism), dividing giant cells, believed to be due to nuclear fusions, were a conspicuous feature of the crown gall tissue. Cells with the diploid (24), tetraploid (48), and octaploid (96) numbers of chromosomes were observed.

MACKIE (W. W.). **Diseases of grain and their control.**—*California Agric. Exper. Stat. Bull.* 511, 87 pp., 46 figs., 1931.

Popular notes are given on a number of well-known fungous, bacterial, and non-parasitic diseases affecting cereals, flax, and sunflowers in California, with directions for their control.

McKINNEY (H. H.). **Differentiation of viruses causing green and yellow mosaics of Wheat.**—*Science*, N.S., lxxiii, 1902, pp. 650–651, 1931.

In order to obtain information that might lead to a differentia-

tion of the viruses responsible for the green and yellow mosaics of wheat in Illinois and Indiana [*R.A.M.*, ix, p. 580], a predominantly yellow virus was obtained from a Red Winter spelt plant with medium yellow mosaic, and a predominantly green from a Harvest Queen wheat plant with green mosaic. The disease was contracted in both cases from infested soil transported to Arlington Farm, Virginia, from an infested area in Illinois. Healthy seedlings of Harvest Queen wheat and Red Winter spelt were inoculated with each of the extracts by the method previously described [ibid., v, p. 86].

Mosaic symptoms appeared after two to ten weeks from the date of inoculation (usually four to five weeks). The Harvest Queen wheat showed a predominance of yellow mosaic when inoculated with the yellow mosaic virus, and of green mosaic when inoculated with the green mosaic. Most of the plants, however, showed some signs of both types, and in the majority of cases typical rosette developed in both inoculations. All the Red Winter spelt plants developed yellow mosaic, the symptoms being more intense in those inoculated with virus from the yellow mosaic plant. Rosette never occurs in this variety of spelt.

In four additional successive tests the yellow and green mosaic viruses were obtained, respectively, from the plants with the most pronounced yellow and green mosaics in the previous experiments. In each successive test the green mosaic became consistently more green and the yellow more yellow. No rosette occurred in any of the tests after the first with the yellow mosaic virus, but the typical symptoms of this disturbance were observed in every test in the Harvest Queen plants inoculated with green mosaic. In the fifth test only Harvest Queen plants were inoculated. Those inoculated with yellow mosaic developed the most severe symptoms as yet encountered in wheat mosaic. Soon after the first signs of the disease appeared many of the leaves became almost entirely yellow and quickly died. In the fourth and fifth tests the green mosaic symptoms were very mild in many of the plants, but rosette developed in a typical manner.

It is evident from these experiments that the wheat mosaic represents a mixture of types which can be resolved into distinct yellow and green forms. The former has been concentrated in relation to the latter and has been intensified on Harvest Queen wheat, which usually shows only slight traces of it in nature. Rosette is only associated with green mosaic on Harvest Queen wheat. A very faint trace of yellow mosaic still appears in a few Harvest Queen plants with the purified green mosaic, while on spelt the yellow mixture is more conspicuous [cf. ibid., x, p. 411].

QUISENBERRY (K. S.). **Inheritance of winter hardiness, growth habit, and stem-rust reaction in crosses between Minhardi winter and H-44 spring Wheats.**—*U.S. Dept. of Agric. Tech. Bull.* 218, 46 pp., 3 pl., 5 graphs, 1931.

In the part of this paper dealing with investigations conducted at St. Paul, Minnesota, into the inheritance of resistance to *Puccinia graminis* in crosses between Minhardi winter wheat (resistant) and H-44 spring wheat (susceptible) it is stated that

the F_2 results, obtained from both autumn sown and spring sown material, indicated a single factor difference for resistance and susceptibility, whereas the F_3 studies proved that such an explanation was inadequate. In addition to the major genetic factor involved, other minor modifying factors must be assumed to explain the reaction obtained. There was little relation between the rust reactions of a line sown in autumn and the same line sown in spring; this is considered to indicate the presence of different physiologic forms of the rust or a different expression of the genetic factors, resulting from the different lengths of the respective growing periods. In the greenhouse a segregation approximating to 1 resistant, 2 segregating, and 1 susceptible was obtained from F_3 lines inoculated with physiologic form 60 of *P. graminis*. There was an indication of minor factors influencing the expression of rust reaction, even in the greenhouse. The behaviour of the lines was the same when they were inoculated with form 36, which shows that the same factor or factors control the reaction of the seedlings to both these forms of the rust. No close relation could be established between the reaction to the rust of the greenhouse seedlings and that of the mature plants in the field. It appears that genetic factors, in addition to those controlling the reaction in the seedling stage, are necessary to explain the reaction of the mature plant.

DASKALOFF (C.). **Die biologische Spezialisierung bei den Getreiderostpilzen und ihre Bedeutung für die Rostresistenzzüchtung. Untersuchungen über Weizenbraunrost Puccinia triticina Erikss. in Bulgarien.** [Biologic specialization among the rust fungi and its significance in breeding for rust resistance. Investigations on brown rust of Wheat, *Puccinia triticina* Erikss., in Bulgaria.]—*Staatl. Landw. Versuchs- und Kontrollstat.*, Sadowa, Bulgarien, 1930. (Bulgarian, with German summary.) [Abs. in *Neuh. auf dem Geb. des Pflanzensch., 1931*, 3, p. 71, 1931.]

From one Bulgarian collection of brown rust of wheat (*Puccinia triticina*) the writer isolated 12 lines belonging to the same type [*R.A.M.*, ix, p. 768]; another collection, from a different locality, yielded 5 lines of which 4 represent familiar types, while the fifth is an unknown form [cf. ibid., x, p. 17]. The heavy damage caused annually by this rust in Bulgaria is attributable to the particularly virulent lines isolated by the author.

BRIGGS (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in hybrids of White Federation and Banner Berkeley Wheats.**—*Journ. Agric. Res.*, xlii, 5, pp. 307–313, 1 graph., 1931.

In continuation of his studies of the inheritance of resistance to *Tilletia tritici* [*T. caries*] in different varieties of wheat [*R.A.M.*, ix, p. 515] the author describes experiments with the F_1, F_2, and F_3 generations of a cross between the susceptible White Federation and the resistant Banner Berkeley; a cross between Martin and Banner Berkeley was also made in order to determine whether the Martin factor was present in Banner Berkeley.

The results obtained [which are tabulated, expressed graphically, and fully discussed] suggest that the single factor for resistance to bunt present in White Odessa is identical with the Martin factor and that White Odessa should, like Martin, be designated *MMhh* [loc. cit.]. Banner Berkeley was found also to have one main factor for resistance identical with that present in Martin, and is, therefore, also of the *MMhh* constitution.

The bunt used in all the inoculation experiments was Reed's physiologic race III [ibid., vii, p. 369] and provided there are no other factors for resistance to bunt, which would then become apparent in the presence of other physiologic forms, then Martin, Banner Berkeley, and White Odessa should, if the *MMhh* designation is correct, give the same reaction to all physiologic forms of *T. caries*. Hussar (*MMHH*) should not be susceptible to any forms to which the Martin group is resistant, and, because of the *H* factor, should be resistant to some forms which attack Martin. Owing to insufficient data, this point has not yet been verified.

BONNE (C.). **Untersuchungen über den Steinbrand des Weizens.** [Investigations on Wheat bunt.]—*Angew. Bot.*, xiii, 3, pp. 169–239, 4 graphs, 1931.

The author's investigations [the results of which are fully discussed and tabulated] on the conditions governing the infection of wheat by *Tilletia tritica* [*T. caries*] in Germany showed that the calculation of the mean error (m) is not adapted to bunt experiments, since fluctuations in the values are due to systematic, and not to casual, errors. Reliable results are more likely to be obtained by a repetition of the tests with several varieties, without reference to the mean error, than by numerous replications with one variety taking the mean error into consideration.

The incidence of bunt at different sowing dates is conditioned primarily by the temperatures prevailing in the soil after sowing and during germination; the optimum for the germination of wheat is 26° to 28° C. and for *T. caries* 15° to 20° C. [*R.A.M.*, x, p. 19].

In soil inoculation tests it was impossible to secure infection after three to four weeks, during which time all the spores germinate. The isolated cases of soil infection occurring in practice may be explained by the presence of spores in the deeper layers of the soil and the prevention of germination by deficiency of oxygen.

No correlation could be detected between the rate of growth of resistant and susceptible varieties and the incidence of bunt. The majority of the wheat varieties used in the tests were highly susceptible and none was immune.

The collections of *T. caries* from various sources differed in their capacity to infect the summer and winter wheats [ibid., viii, p. 766 *et passim*], but equally marked divergences were observed between strains of the fungus of the same origin from different varieties. In view of the correlations existing, on the one hand, between origin and germinability, and on the other, between spore maturation and germinability, it is recommended that particular attention be paid to the germinative capacity of the spore material in biotype experiments.

KRAUSS (J.). **Zur Prüfung der Leistung von Trockenbeizgeräten.** [On the testing of the efficacy of dusting apparatus.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* xi, 5, pp. 34–35, 1931.

Full technical details are given of a method for estimating the quantities of copper carbonate adhering to wheat seed-grain after treatment, and of the amounts thus determined in a number of discontinuously working steeping apparatus [cf. *R.A.M.*, ix, p. 707]. A representative sample (about 100 gm.) of the treated grain is taken and placed in an Erlenmeyer flask; 100 c.c. of 25 per cent. acetic acid are added and the flask shaken for 2 minutes. The copper in an aliquot part of the liquid is then determined either electrolytically or by the gravimetric method described. About 96 per cent. of the copper theoretically recoverable can be estimated in this way. The copper content of the seed disinfectant itself can be ascertained by solution in 25 per cent. acetic acid and titration and from these data the adherence of the dusts can be calculated.

The adherence of copper carbonate (3 gm. per kg.) after treatment (for 3 minutes) in various machines was as follows. Globus (G. W. Barth, Ludwigsburg in Württbg.), 88·5 per cent. (5 mins.: 93·1 per cent.); the same, 2 gm. per kg., 92·2 per cent. (5 mins.: 93·1 per cent.); Puk (P. Lübke, Brieg), 82 per cent.; Lothrä I (F. Thränhardt, Leipzig), 84·8 per cent.; Primus B II (G. Drescher, Halle a.d. Saale), 82·5 per cent.; Ideal No. 1 (Mayer & Cie, Heumar, Bz. Köln Kalker Trieurf.), 86·3 per cent.; Klein-Tillator (I. G. Farbenindustrie, Höchst), 90·1 per cent.; Abavit-Beiztrommel (L. Meyer, Mainz), 90·1 (5 mins.: 91·2, 10 mins. 94·1 per cent.), respectively. The method is applicable in a modified form [which is indicated] to the testing of continuously working apparatus.

WINKELMANN (A.). **Eine Methode zur schnellen Bestimmung des Beizbelages bei Verwendung kupferhaltiger Trockenbeizmittel.** [A method for the rapid determination of the degree of incrustation of the disinfectant for use with copper-containing dusts.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* xi, 6, pp. 44–45, 1931.

Hilgendorff's method of determining the degree of incrustation of copper-containing dusts used in the disinfection of seed-grain [*R.A.M.*, ix, p. 707] has been curtailed as follows. The ether, instead of being distilled off, is filtered off through an asbestos Gooch crucible, and the copper in the residue is then dissolved by treatment with 15 per cent. acetic acid. This modified procedure proved unsuitable for the determination of tillantin, but otherwise the same amounts of the dusts were found as by the distillation method, viz. tutan alt 93·5 per cent. of the total, tutan neu 92·5, and sporosol 88.

Further experiments showed that all the copper-containing dusts so far tested (by Krauss's method) [see preceding abstract] are readily removable from the seed-grain in 25 per cent. acetic acid, whereupon determinations can be made by Hilgendorff's method of titration. Preparations containing arsenic should be treated

with bromide before titration. The determination of the copper in non-arsenic-containing preparations takes about ten minutes. The following were tested at random (100 gm. per cwt.): debanol 95 per cent., copper carbonate 95·5, sporosol 95, tillantin 94·5, trockenbeize Heyden W 95, and tutan 94·5.

HÜLSENBERG (H.). **1930, ein Jahr der Fusskrankheiten bei Weizen.** [1930, a year of foot rots in Wheat.]—*Landw. Wochenschr. Sachsen*, lxxxviii, pp. 607–609, 1930. [Abs. in *Neuh. auf dem Geb. des Pflanzensch., 1931*, 3, p. 70, 1931.]

Ophiobolus graminis is stated to have been very prevalent on wheat in Saxony during 1930 in consequence of the luxuriant growth of the plants in the spring [*R.A.M.*, x, p. 512]. The conditions governing the development of this organism are stated to differ from those required by *O. herpotrichus* and *Leptosphaeria herpotrichoides*. Foot rots occur with greater frequency on crops that have been heavily damaged by lodging, and are particularly liable to affect wheat following peas.

WAHLUND (S.). **Gelbrostbestimmungen an Wintergerste. Eine statistisch-methodologische Untersuchung.** [Yellow rust determinations on winter Barley. A statistical-methodological investigation.]—*Hereditas*, xv, 2, pp. 194–212, 1 graph, 1931.

Full details are given of the working out of an algebraic formula for the statistical determination of the intensity of infection by yellow rust (*Puccinia glumarum*) on barley. With the aid of this method rust determinations were carried out in 1930 at Svalöf, Sweden, on 1,877 plants of the Derenburg 8 variety, 1,557 of Janetzki Original, 1,499 of Mansholt (Groningen) Original, and 1,586 of Eckendorfer Original. The numbers of teleutosori on the leaf sheaths were determined and the material placed in five groups, ranging from very slight to very severe infection. On this basis it was found that Derenburg 8 was the most resistant and Janetzki the most susceptible, the two other varieties occupying intermediate positions.

POPP (M.). **Untersuchungen über die amerikanische Giftgerste.** [Investigations on the American poison Barley.]—*Chem. Zeit.*, liv, 74, p. 715, 1930.

The toxicity to pigs of American barley infected by *Gibberella saubinetii* in north-west Germany during the autumn of 1928 [*R.A.M.*, x, p. 514] is attributed to chemical changes in the composition of the barley, the carbohydrates and albumins being partially disintegrated and toxalbumin or related toxic nitrogenous compounds formed, which caused sickness in pigs and also in poultry. Since the toxic substances are water-soluble the grain may be rendered innocuous by treatment with water, but this is not practicable on a large scale. The admixture of healthy with diseased grain failed to prevent loss of weight in the pigs. The infection of the American barley occurs during growth and is particularly prevalent after a damp autumn, when the straw lying

in the fields constitutes a favourable medium for the parasite. Pure cultures of the fungus were not toxic.

NICOLAISEN (W.). **Beitrag zur Immunitätszuchtung des Hafers gegen Ustilago avenae (Pers.) Jens.** [Contribution to the breeding of Oats for immunity from *Ustilago avenae* (Pers.) Jens.]—*Zeitschr. für Züchtung*, A, xvi, 2, pp. 255–278, 1 fig., 1931.

Systematic investigations at the Halle Agricultural and Plant Breeding Institute are stated to have confirmed the value of Reed's inoculation method for the accurate determination of slight varietal differences in the degree of susceptibility to oat smut (*Ustilago avenae*) [*R.A.M.*, iv, p. 343; x, p. 515]. Four days should elapse before the dry germination bed is moistened. Where the differences to be tested are considerable, or if the work on the inoculation of hybrid populations is of a preliminary nature, the removal of the glumes may safely be omitted, the spores being inserted between the caryopsis and the glume according to Zade's evacuation technique [ibid., iii, p. 643].

The results [which are tabulated] of inoculation tests on oats with collections of *U. avenae* from Germany, the United States, and Finland, showed that a separation of the varieties and species into susceptible and immune categories is misleading. Within each are susceptible and resistant strains. Nearly all the German selected varieties were found to be highly susceptible; a group of yellow oat varieties, however, showed slight to moderate resistance. The only German variety reputed to be immune, viz., Lischower Frühhafer, contracted up to 77·5 per cent. infection with loose smut collections from certain regions, while the resistant v. Lochow's Gelbhafer was infected to the extent of 100 per cent. The Black Mesdag variety remained immune in all the tests [ibid., x, p. 520]. Thus the existence of biologic strains within *U. avenae* is demonstrated. Immune and resistant varieties were more widely represented among foreign than among German oats.

The inheritance of resistance to *U. avenae* was found to be dominant over that of susceptibility. Whereas previous investigations on crosses within the species *Avena sativa* resulted in monomerous segregation ratios, in the present studies a case of trimerous segregation was observed in a cross between v. Lochow's Gelbhafer and Black Mesdag. Di- and trimerous segregation ratios occurred as before in crosses between varieties of *A. sativa* and those of *A. byzantina*. Crosses between immune and resistant varieties yielded also highly susceptible progeny, while from a cross between a resistant and a slightly susceptible variety immune and highly susceptible individuals were obtained.

STOREY (H. H.). **The inheritance by a leafhopper of the ability to transmit a plant virus.**—*Nature*, cxxvii, 3216, p. 928, 1931.

In the course of studies at Amani, Tanganyika Territory, on the transmission of streak of maize by the leafhopper *Cicadulina mbila*, the author has frequently found individuals failing to transfer the virus under conditions normally favourable to the

process [*R.A.M.*, ix, p. 765]. Repeated tests of such individuals after further periods of feeding on diseased plants, indicated that the insects were incapable of acting as vectors of this virus.

A study has recently been made of the inheritance by *C. mbila* of the capacity for transmitting the streak virus by breeding successive generations from parents selected for this character. In this way races breeding true for the character selected have been obtained. The 'active' races consist of leafhoppers, every individual of which will invariably transfer the streak virus under suitable conditions. The 'inactive' races, on the other hand, are composed of individuals all of which are incapable of transferring the virus. No morphological differences have been found between the hoppers of these several races.

The character of 'activity' was found to behave in inheritance as dominant to that of 'inactivity'. A further study of crosses between the two pure-breeding races confirmed this conclusion and showed, moreover, that the character is sex-linked. Thus, the cross active male × inactive female gave F_1 progeny of inactive males and inactive females. In the F_2 generation, active and inactive leafhoppers developed in approximately equal numbers in each sex. The reciprocal cross, inactive male × active female, yielded an entirely active F_1 offspring, with segregation in the F_2 generation into active and inactive males in about equal numbers, and only active females.

These results accord with the familiar *Drosophila* type of sex-linked inheritance.

JOHNSTON (C. O.) & MAINS (E. B.). **Relative susceptibility of varieties of Sorghum to rust, Puccinia purpurea.**—*Phytopath.*, xxi, 5, pp. 525–543, 7 figs., 1931.

Further investigations [the results of which are fully discussed and tabulated] on the reaction to rust (*Puccinia purpurea*) of different sorghum varieties at Lafayette, Indiana, and Manhattan, Kansas [*R.A.M.*, viii, p. 377] showed that, in general, the kafir and sorgo groups are moderately susceptible, the feteritas highly susceptible, and the milos very resistant. The kaoliang and broomcorn groups comprised both resistant and susceptible varieties. Shallu was found to be highly resistant in the field throughout the trials (1927 to 1930), while White durra was susceptible. Johnson grass (*Holcus* [*Andropogon*] *halepensis*), Tunis grass [*A. sorghum* var. *exiguus*], and Sudan grass [*A. sorghum* var. *sudanensis*] were also susceptible. Milo × feterita hybrids seem to be more susceptible than milo × kafir, Kansas Orange × Dwarf Yellow milo, and Dwarf Yellow milo × Pink kafir, the two latter crosses containing several highly resistant selections. The pronounced purpling accompanying uredospore development on most varieties was absent in shallu CI 85, White durra CI 81, and the Leoti Red FCI 6610 and Japanese Honey Drip KB 2896 sorgos, which are apparently deficient in the factors governing the production of red pigment in the foliar tissues.

P. purpurea failed to infect a number of varieties of sweet and Dent maize, while no infection resulted from the inoculation of

115 strains and varieties of sorghum with *P. sorghi* [*P. maydis*] physiologic form 1 [ibid., x, p. 305].

GRILLO (H. V. da S.). **Estudo sobre o 'Septobasidium albidum' da Laranjeira.** [Study on *Septobasidium albidum* of the Orange.]—*Agronomia* (*Ann. Soc. Brasil. Agron.*), i, pp. 265–276, 2 pl., 1930. [Received July, 1931.]

Septobasidium albidum (also known as *S. pseudopedicellatum* and *Thelephora pedicellata*) is stated to occur in Brazil on various species of *Citrus*, of which the leaves, branches, stems, and fruits are attacked in overcrowded plantations under warm, humid conditions. *S. albidum* forms on the above-mentioned organs a whitish to grey, later chocolate-coloured, superficial stroma, below which are coccids (*Lepidosaphes pinnaeformis*). The relations between the insect and the fungus are considered to be possibly symbiotic [cf. *R.A.M.*, x, p. 595]. Good control of *S. albidum* has been obtained by pruning, brushing the stems and branches with special brushes soaked in lime-sulphur, and spraying with lime-sulphur or solbar.

FAWCETT (G. L.). **La verrucosis de los 'Citrus'.** [Citrus scab.] —*Rev. Indust. y Agríc. Tucumán*, xxi, 3–4, pp. 59–62, 3 figs., 1931.

Popular notes are given on the occurrence of the citrus scab [*Sporotrichum citri*] in Tucumán, Argentine Republic, where two forms of the fungus appear to occur. One of these is found on sweet and bitter oranges and mandarins and occur chiefly on the fruits, the leaves being never seriously affected. The other occurs on lemons and is also capable of attacking the bitter orange, on which it causes severe leaf infection; it is found sometimes also on pomelos. It appears that the organisms responsible for these two forms of the disease are different. Instructions are given for the control of the disease by Bordeaux mixture or lime-sulphur spraying.

FAWCETT (H. S.). **Observations on the culture and diseases of Date Palms in North Africa.**—Reprinted from *Eighth Ann. Rept. Date Growers' Inst.*, 4 pp., 1931.

This is a summary of the observations on the cultivation and diseases of date palms made by the author during his visit to North Africa from January to March, 1930, supplemented by references to the United States. The most destructive disease is that known as 'baïoud', usually associated with the fungus *Cylindrophora albedinis* [*R.A.M.*, x, p. 100]. It occurs in Morocco south of the Atlas Mountains and has now spread to the Beni Ounif section of western Algeria. So serious is this disease, which the writer states is the worst he has seen on any plant, that he urgently recommends an international investigation of its etiology and the possibilities of control.

The 'khamedj' disease of the inflorescences, due to *Mauginiella scaettae* [ibid., x, p. 185], is known in Tunis, Algeria, Morocco, and in Italy as far north as San Remo, but has not yet been observed in Egypt, Arizona, or California.

Smut (*Graphiola phoenicis*) [ibid., x, p. 184] is widely distributed near the Mediterranean coast and inland where the humidity is sufficient. It is also present in most localities in California, except the Coachella Valley, and in a mild form in Arizona. This was the most prevalent disease of date palms in Egypt, and along the Nile infection was so severe that growth and production must be seriously hampered.

The *Diplodia* disease [? *D. natalensis*: ibid., ix, p. 649] was found on Deglet Noor and other date varieties in the same oases in southern Tunisia from which offshoots had been brought to California. What was apparently a mild form of the same disease was also observed in Algeria and Egypt.

Dry bone [see next abstract] was found in nearly all the date sections of Northern Africa.

Specimens of black scorch associated with *Thielaviopsis* [*Ceratostomella paradoxa*: see next abstract] were found in Egypt, and spores resembling those of this fungus were also detected on dead leaf bases in Tunis and Algeria.

Anthracnose (? *Gloeosporium* sp.), which causes a minor spotting of the leaf, midrib, and pinnae, was found to be widely distributed in Algeria, Tunis, and Egypt, and has also been observed in Arizona and California.

A brown, striate discoloration of old petioles, associated with *Anthostomella* (?) *molleriana*, was found in Egypt, Algeria, Tunis, and Palestine, and is present also in Arizona and California.

KLOTZ (L. J.). **Investigations on Date Palm diseases.**—*Eighth Ann. Rept. Date Growers' Inst.*, pp. 14–18, 1931.

A summary is given of the information so far available regarding the 'decline' disease of Deglet Noor date palms in California [see below, p. 657]. Beneficial effects continue to follow the application to the soil of copper sulphate in amounts up to 75 lb. disked into the circular area (750 sq. ft.) surrounding each palm, with subsequent basin irrigation.

A disease for which Dr. H. S. Fawcett proposes the name of 'black scorch' is caused by *Thielaviopsis* [*Ceratostomella*] *paradoxa* [see preceding abstract], which causes a dull, charcoal-like darkening of the tissues of the spathes, fruit stalks, buds, heart, and fronds. Conidia apparently belonging to *C. paradoxa* were found on samples of similarly affected material from Egypt and Algeria. The optimum temperature for the growth of the fungus was found to be 24° to 27·5° C. Positive results were given by inoculation experiments [which are described] on the midrib bases of the second whorl of fronds on a seedling offshoot, the pathogen being readily re-isolated from the diseased tissues.

Work is still in progress on the *Diplodia* disease [? *D. natalensis*: see preceding abstract]. The typical dark, elongated lesions have been found on the frond midribs of 20 different date varieties. Dr. Swingle has recently found the organism, together with a *Fusarium*, on several decaying male inflorescences. Promising results have been obtained in experiments at Indio by the immersion of infected offshoots (up to but not including the bud)

in various fungicidal solutions including Bordeaux mixture and ammoniacal copper carbonate (5 oz. $CuCO_3$ dissolved in 3 pints of ammonia in 1 gall. of water and then diluted to 50 galls.), both of which appeared to exercise a stimulatory effect on the offshoots, and the latter material has also proved satisfactory on a larger scale.

A pathological condition known as 'dry bone', generally of minor importance but liable to cause serious damage to seedlings, is characterized by elongated, greyish-white, slightly elevated areas with a reddish-brown margin, which may completely envelop the midrib of the frond and extend out over the pinnae. Inoculation tests with a bacterium isolated from the diseased tissue indicate that this organism is responsible for the disturbance.

The smut of fronds caused by *Graphiola* [*phoenicis*: see preceding abstract] has been found in two localities in California and two in Arizona, the damage in every case apparently being slight.

Good control of 'black nose' of date fruit [see next abstract] was obtained by spraying bunches in the field with 1 in 40 lime-sulphur, three applications being given at monthly intervals beginning on 4th June, 1930. This treatment, however, retarded the maturation of the fruit, while Bordeaux mixture (5–5–50) and ammoniacal copper carbonate accelerated it and gave approximately the same degree of control.

Cured and packed dates were found to be infected by *Catenularia fuliginea* [*Torula sacchari*: ibid., viii, p. 66], which sporulates in reddish-brown, *Monilia*-like cushions, rendering the fruit unfit for sale. The fungus was killed by one minute's immersion in a steam bath of 95° to 100° C.

Inoculation experiments on wounded and unwounded dates, half of which were previously dusted with Bordeaux, with spore suspensions of nine species of fungi at 22° to 25° indicated that *T. sacchari* caused the highest rate of decay and *C. paradoxa* the lowest, while *Aspergillus niger*, *Penicillium roseum*, *P.* sp., *Phomopsis* sp., *Helminthosporium* sp., *Alternaria*, and *Diplodia* [? *natalensis*] were intermediate in their effects. The Bordeaux-dusted fruit appeared to be less affected than the untreated, indicating the desirability of field treatment with this preparation in rainy seasons. All the fungi tested, with the possible exceptions of *Alternaria* and *Helminthosporium*, are wound parasites. *Torula sacchari*, however, seems to make profuse growth on the cuticle of the date in the presence of sufficient moisture, being often found enveloping stored fruit covered with syrup.

Strands of dates were placed in atmospheres of varying humidity from 0 to 100 per cent. to test the effect of moisture on the production of cracks. The humidities were obtained by the use of sulphuric acid of various concentrations (*Phytopath.*, vi, p. 428, 1916). Cracks developed only in chambers with 100, 89·9, and 80·5 per cent. humidity, under which conditions the fruit rapidly became covered with several species of *Aspergillus* and *Penicillium*. The fungi decreased at the lower humidities and none occurred in the chambers with 0, 10·5, and 21·5 per cent. humidity. Under the latter conditions, however, a slight but distinct shrinking of the fruit was observed. These data, coupled with the prevalence

of rot on low hanging bunches of dates in the field, clearly indicate a correlation between excessive humidity and spoilage.

KLOTZ (L. J.). **Diseases of the Date Palm.**—*Seventh Ann. Rept. Date Growers' Inst.*, pp. 7–10, 1930. [Received August, 1931.]

A fruit spot of dates caused by species of *Alternaria* and *Helminthosporium* [see preceding abstract] has been described by J. G. Brown, of the Arizona Experiment Station [*Bot. Gaz.*, lxix, 6, pp. 521–529, 5 figs., 1920]. The fungi form small brown, sometimes translucent spots, enlarging to circular, darkened areas, near the centre of which the fruiting bodies appear. Up to 95 per cent. of the susceptible Deglet Noor crop has been damaged by this disease in Arizona. The results of inoculation experiments on wounded and unwounded fruit indicated that the fungi in question are usually wound parasites which may, however, under conditions favouring their growth, attack unwounded dates, penetration in such cases presumably occurring through the unbroken cuticle.

Calyx end rot, another disturbance liable to accompany or follow wet weather, is most frequently associated with the presence of *Aspergillus niger* in the seed cavity just below the dried remnants of the perianth.

Black nose [see preceding abstract] is characterized by a darkening and slight or severe cracking of the distal end of the dates, involving as much as half of the flesh. The cracks afford entrance to various fungi, e.g., *Rhizopus*. *Hormodendrum*, *Penicillium*, *Alternaria*, and *Phomopsis*, as well as bacteria. However, the fact that several plantings made from the inner tissue before the formation of the cracks remained sterile appears to indicate a physiological or nutritional foundation for the trouble. Mr. R. H. Postlethwaite has suggested that the date under certain drying conditions transpires water faster than the sugar manufactured in the leaves can be translocated to the fruit, with the result that the tissues are injured by desiccation and black nose ultimately develops.

Bud scorch [*R.A.M.*, x, p. 185] is a minor trouble characterized by the distortion of the emerging leaves, usually accompanied by a blackening of the midrib. Species of *Fusarium* and *Penicillium* and a *Diplodia* have been obtained from the affected midrib.

'Fool disease' [loc. cit.] is a distortion in which the terminal bud suddenly begins to grow laterally instead of vertically.

A bud rot of six-year-old palms was observed in which the affected tissues were black and hard.

Notes are given on certain other diseases of date palms to which reference has already been made in the preceding abstracts.

HAAS (A. R. C.) & KLOTZ (L. J.). **Nutrition and composition of the Deglet Noor Palm in relation to the decline disease.**—*Hilgardia*, v, 16, pp. 511–530, 5 figs., 1931.

A serious disease known as 'decline', frequently associated with *Diplodia* [? *natalensis*: *R.A.M.*, ix, p. 649], has developed among Deglet Noor date palms in the Coachella Valley, California. Characteristic features of the disease are the retardation and

eventual cessation of growth, destruction of roots, and gradual reduction in the quality and quantity of fruit produced. Investigations have as yet given few clues to the probable cause of the disease.

Comparative analyses [the results of which are discussed and tabulated] showed that the diseased pinnae are lower in carbohydrates, total nitrogen, potassium, and phosphorus, but higher in calcium than healthy ones. The symptoms of decline would thus appear to be correlated with disturbances in the metabolism of the organic and inorganic constituents of the palms. Copper sulphate applied to the soil round one severely diseased palm (16 lb. in solution on 30th November, 1929, and 34 lb. on 4th January, 1930) effected a marked improvement in three months, as shown by new growth and by the composition of the pinnae. No untreated palms have been known to recover from the disease.

BRITON-JONES (H. R.) & CHEESMAN (E. E.). **Witch broom control.** —*Trop. Agriculture*, viii, 4, pp. 79–89, 2 pl., 1 diag., 1931.

When the dormant buds of ten cacao seedlings were inoculated [by a method which is indicated] with the sporophores of *Marasmius perniciosus* [*R.A.M.*, ix, pp. 438, 752], while two plants failed to make any growth, the remainder produced 15 shoots, all of which remained perfectly normal throughout the experiment. On the other hand, when the plants were cut back to just above dormant buds and the latter were inoculated after a fortnight, when growth had commenced, infection was obtained in a number of cases. These results are considered clear evidence that only those cacao buds which have already made growth can become infected by the witches' broom organism. Visible results of successful inoculation may take more than three weeks to appear.

A broom kept for seven months at approximately 90 per cent. humidity in a desiccator and treated daily with a fungicide to prevent the growth of surface fungal 'weeds', when submitted for a fortnight to prolonged, intermittent showers of tap water, developed three sporophores of *M. perniciosus*, the smallest of which measured about half an inch and the largest almost an inch in diameter. This is stated to be the first occasion that *M. perniciosus* has been induced to fructify under laboratory conditions. It would appear that sporophore production is not governed by atmospheric humidity; the brooms must be subjected to frequent showers of rain (or tap) water.

Under Trinidad conditions there is a sudden increase in the prevalence of the disease during the wet period between May and October; when drier weather sets in the incidence of the disease drops, to rise again when this short period ends. This is not due merely to the fact that the sporophores are not produced under dry conditions: the advent of the rainy season in May causes a flush of growth in cacao, when previously dormant buds burst and so become liable to infection. The number of dormant buds breaking out depends on several factors. In Trinidad, cacao defoliates during the long dry season, and this defoliation is generally followed about six weeks later by a flush of growth. If the drought is prolonged there is less extensive growth than

under more favourable soil conditions, and what there is takes place in a shorter time. With the onset of the rains in May or June not only is there a further extension of the existing growth, but the dormant buds are also stimulated into development. Thus the production of sporophores at the beginning of the wet season coincides with the stimulation into growth of dormant buds which only then become liable to infection.

As regards control, it is suggested that growers should continue to cut out and destroy the diseased parts and should make every endeavour to improve the condition of the cacao. Spraying with Bordeaux mixture is not regarded as likely materially to affect the incidence of infection and is not recommended, as being expensive, difficult to apply, and unsuitable by reason of the shortage of labour and water on the cocoa plantations.

There is a bibliography of 20 titles.

De Carvalho (J. N.). **O Cafeeiro e suas pragas na Parahyba do Norte.** [Coffee and its pests in Parahyba do Norte.]—*Agronomia* (*Ann. Soc. Brasil. Agron.*), i, pp. 99–118, 1 fig., 1 diag., 1930. [Received July, 1931.]

The two chief fungous pests of coffee in Parahyba do Norte, Brazil, are stated to be *Cercospora coffeicola* and *Rosellinia necatrix*. The former produces grey 'eye spots' on the leaves and cotyledons, causing desiccation, yellowing, and defoliation. The conidiophores occurring in the pale centres of the spots measure 85 to 127 μ in length, and the hyaline conidia are 56 to 156 μ long and with 7 to 17 transverse septa.

The rhizomorphs of *R. necatrix* were observed extending over the rotted roots in the form of a network.

Muller (H. R. A.). **Snoei als middel om de verspreiding van topsterfte te remmen.** [Pruning as a means of checking the spread of top die-back.]—*Arch. voor Koffiecult. Nederl.-Indië*, v, 1, pp. 1–9, 2 graphs, 1931.

Details are given of experiments in south Sumatra on the control of top die-back of coffee by pruning [*R.A.M.*, x, p. 518]. It was found that, in the incipient stage of the disease, pruning constitutes an effective check on further spread, while even in cases of heavy infection this measure assists greatly in the restriction of the disturbance. So marked was the difference between pruned and unpruned plots that extended trials of this method are recommended. From 70 to 80 per cent. of the new shoots formed by pruned trees affected by die-back were found to be healthy.

Dastur (J. F.). **A short note on the diseases of Cotton seedlings in the Central Provinces.**—*Agric. & Live-Stock in India*, i, 1, pp. 44–48, 1931.

During a study of cotton wilt [*R.A.M.*, ix, p. 452] in the Central Provinces, India, the author noted that while in the seedling stage many plants died without showing any typical wilt symptoms. Cotton varieties highly resistant to wilt were often very susceptible to the seedling diseases, which took the form of a wet rot or damping-off due to a *Pythium* and a *Phytophthora* and a dry rot

or sore-shin caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., viii, p. 566; ix, pp. 32, 82].

In the former condition the collar is soft and rotten and occasionally constricted, the stem falls over at or near the surface of the ground, the underground parts are decayed and water soaked and the diseased seedlings cannot be uprooted intact. This disease is capable of producing infection only in very humid conditions or when the soil is waterlogged and at a time when the seedlings are not more than two to three weeks old. One cause of the non-germination of cotton seeds is infection by these fungi and consequent death of the seedlings before they can break through the soil surface.

The dry rot caused by *M. phaseoli* is easily distinguished by the stems of the plants remaining upright. The disease affects the collar, the roots, and the leaves, but is fatal only when the collar or roots are attacked. Diseased seedlings can be easily uprooted and the infected part of the tap-root is thinner than the healthy parts. When cotyledons are lightly infected they look as if they had been badly pinched, but when the whole cotyledon is diseased it is shrunken, small, and hangs limply. Infected leaves look as if they were being bleached and later turn brown; they are shrunken, crisp, and brittle and have a tendency to roll inwards. This form of infection remains confined to the diseased leaf which is ultimately shed from the plant. Although the disease is usually confined to plants under twelve weeks old, it can also affect mature plants, as was seen in Nagpur in 1927, where in one field the leaves of plants three to four months old became affected; the plants put out new leaves and recovered. In 1930, a root rot of cotton, in some localities causing considerable damage, was associated with the presence of *M. phaseoli* in the tap roots. Many attempts to reproduce the disease in seedlings by inoculation with *M. phaseoli* gave negative results [cf. ibid., vii, p. 119; viii, p. 756] but inoculations on the leaves were always successful, the infected leaf dropping from the stem as in natural infections.

It has now been found that *M. phaseoli* is capable of causing infection only under certain limited soil conditions. Any delay in the appearance of the cotyledons above the soil surface favours infection of the seedling. Seeds which are naturally very slow in sprouting are particularly susceptible and, where soil conditions themselves are unfavourable to quick germination, heavy losses may occur, at times amounting to as much as 30 per cent. In 1930, many localities reported a high mortality of cotton seedlings, and wherever a detailed examination was made it was ascertained that the worst damage had been sustained in fields sown immediately after the first break of the monsoon. When such fields dried up from the flooding caused by the rain a hard crust formed on the surface of the soil, germination was accordingly delayed, and there was a large number of diseased plants, whereas in fields sown after the heavy rains, i.e., a fortnight later than the first sowing, there was very little disease.

In mature plants dry rot does most damage when they grow in waterlogged fields and when, after heavy rain, the soil cakes round the collar, which becomes flattened out; the crushed bark cracks

longitudinally, enabling the fungus to enter and ultimately to kill the plants. Insect and mechanical injuries are also contributory causes; spiders have been observed to carry infection from leaf to leaf.

R. [*Corticium*] *solani* was occasionally isolated from cotton seedlings [ibid., ix, p. 178] and no morphological differences could be detected between the symptoms produced by it on seedlings and those of *M. phaseoli*. It was not found on mature plants.

Massey (R. E.). **Studies on blackarm disease of Cotton—II.**—*Empire Cotton Growing Review*, viii, 3, pp. 187–213, 4 pl., 1 chart, 1931.

Details are given of further experiments in the laboratory at Shambat, and under field conditions at the Gezira Research Farm, in continuation of the author's investigation of the blackarm disease of cotton (*Bacterium malvacearum*) in the Sudan [*R.A.M.*, ix, p. 779]. The results indicated that the initial infection of the germinating seed is dependent on a combination of external factors, among which soil moisture and soil temperature are predominant, rather than on the effect of soil temperature alone, as suggested in previous papers [ibid., viii, p. 569]. It was shown that the presence of free water in the soil is essential for the translocation of the bacterium from the outside of the seed to the cotyledons at germination, and that germination may take place with a soil moisture content too low to allow infection. On the other hand, the greatest amount of infection was obtained on seedlings grown at a low night temperature succeeded by a day temperature of about 25° C. When seedlings were chilled by watering them with iced water at various times up to 48 hours after sowing, the infection was almost doubled, while this treatment slightly reduced the incidence of the disease when the iced water was applied 72 hours after sowing. These experiments are believed to explain the effect of rainfall within 48 hours of sowing in the Gezira in promoting seedling infection, and it is thought probable that the rains, besides increasing the water content of the soil during the critical period of germination, exert a chilling effect on the seedlings which lowers their resistance to the parasite, while the latter is not seriously affected by such change in temperature. It was further shown that the amount of primary infection is directly proportional to the rate of opening of the seed coats at germination (affording free entry of the parasite to the host tissues), subject to a time limit dependent on the lethal action of the soil on the bacterium.

Although prolonged search failed to detect internal infection of the seed in the samples examined during the investigations described in this paper, previous work carried out with Pima and Ashmouni cotton seed derived from exceptionally heavily infected plants conclusively showed that such infection does occur in nature and should not be ignored.

Experiments made to determine the factors involved in the subsequent spread of the disease in the field confirmed the transmission of infection by rain, but no other method of transmission through the air was indicated. Infected cotton débris remaining in the field was again shown to be a dangerous source of infection, but

the experiments indicated that this danger may be minimized by watering the débris, this leading to the rapid destruction of the parasite contained by them, since once it is liberated and assumes the actively motile condition it is rapidly destroyed in the Gezira soils.

The study of the lethal action exerted on *Bact. malvacearum* by the Gezira soil, which apparently limits its life in wet soil to a period not exceeding 72 hours, showed the presence in the soil, both fallow and cultivated, and also in turbid Blue Nile water (but not in clear water from the Main Nile in January), of a transmissible lytic principle (bacteriophage), the virulence of which was enhanced by repeated inoculations and filtrations. The practical significance of the existence of this principle has still to be studied.

The paper terminates with a summary of the principles underlying the control of the disease in the field.

DANA (B. F.). **Soil cultures for the laboratory production of sclerotia in Phymatotrichum omnivorum.**—*Phytopath.*, xxi, 5, pp. 551–556, 2 figs., 1931.

A method has been devised for the production of sclerotia of *Phymatotrichum omnivorum*, the causal organism of cotton root rot in the United States [*R.A.M.*, ix, pp. 179, 307], in the laboratory under conditions approximating as nearly as possible to those prevailing in the field. Non-sterilized field soil (Houston black clay) of suitable moisture content (30 per cent.) is used as a medium and inoculated with newly diseased roots of a susceptible host, e.g., carrots. Square Mason fruit jars of quart and 2-quart capacity have been found useful as containers.

Comparative tests of the growth of the fungus in soils of varying moisture content showed an optimum at 30 per cent., though development occurred at a range of 10 to 60 per cent. Sclerotia were formed at temperatures of from 21° to 32° C., with an optimum at 27°. At Temple, Texas, the soil temperatures at depths of 6 to 24 inches fall within this range at the season when root rot is active. Both strand development and sclerotial production were inhibited by the application of semesan to the soil.

'The Veterinary Bulletin', Imperial Bureau of Animal Health, Weybridge, Surrey, i, 1, pp. 1–96, 1931.

The Veterinary Bulletin (incorporating the *Tropical Veterinary Bulletin*, the publication of which was discontinued in 1930) contains abstracts, often in considerable detail, of the literature relating to all aspects of animal health, including both original research and administrative and practical control. One of the subjects dealt with is that of animal diseases caused by bacteria and fungi. It is proposed to issue four numbers a year.

KURUP (P. K.). **Rhinosporidium kinealyi infection.**—*Indian Med. Gaz.*, lxvi, 5, pp. 239–241, 4 figs., 1931.

Clinical notes are given on two cases of infection by *Rhinosporidium seeberi* in Madras, one in a woman (possibly the first record of the disease in a female) [cf. *R.A.M.*, ix, p. 111], and the other in a boy. In the former case the fungus caused a pharyngeal

tumour and in the latter a pedicular growth on the right upper eyelid. Both cases were successfully treated by ligature and excision. Infection does not appear to be transmitted direct from man to man, and an intermediary host may be required. The fungus is probably disseminated by dust and water, while close contact with animals, insanitary conditions, and local predilections of the mucous membrane are probably also predisposing factors.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude d'un Verticillium nouveau, parasite de certaines araignées.** [Study of a new *Verticillium* parasitic on certain spiders.]—*Comptes rendus Soc. de Biol.*, cvii, 14, pp. 53–55, 1931.

The writers describe the morphological and cultural characters of a new species of *Verticillium* [which is not named], found parasitizing spiders in Alsace-Lorraine in association with a *Sporotrichum*. The septate mycelium consists of straight hyphae bearing several whorls of primary branches 2 to 4 μ in thickness, of which the lower ones bear secondary verticillate branches, 0·50 to 1·25 μ in thickness; the primary branches terminate in ovoid, hyaline conidia, 3·5 by 1·5 μ, usually single but sometimes occurring in groups of three. The optimum temperature for development on carrot is 22° C.; the spherical colonies are white and downy.

ZEPPONI (G.). **Some observations on certain species of Monilia.**—*Journ. Trop. Med. & Hygiene,* xxxiv, 9, pp. 122–124, 1 pl., 1931.

The results are tabulated and discussed of biochemical investigations on *Monilia* [*Candida*] *tropicalis* [*R.A.M.*, ix, p. 312], *M.* [*C.*] *macedoniensis* [ibid., vi, p. 96] and *M.* [*C.*] *krusei* [ibid., x, p. 520] at the Ross Institute and Hospital for Tropical Diseases, London. *C. tropicalis* was found to form acid and gas in glucose, levulose, galactose, maltose, and saccharose, *C. macedoniensis* in glucose, levulose, galactose, saccharose, and inulin, whilst *C. krusei* forms gas only in glucose and levulose.

ZOON (J. J.). **Blastomycosis cutis durch Monilia fioccoi mit positiver Blutkultur.** [Blastomycosis cutis due to *Monilia fioccoi* with positive blood culture.]—*Dermatol. Zeitschr.*, lviii, 5–6, pp. 356–367, 7 figs., 1930.

Monilia fioccoi Pollacci and Nannizzi (Miceti patogeni, 8, 1928) was isolated from a case of blastomycosis cutis in a 69-year-old man [see next abstract]. A positive blood culture was obtained on Sabouraud's medium.

ZOON (J. J.). **Tierversuche mit Monilia fioccoi. Nachtrag zur Arbeit: 'Blastomycosis cutis usw.'** [Animal experiments with *Monilia fioccoi*. Supplement to the work: 'Blastomycosis cutis', etc.]—*Dermatol. Zeitschr.*, lxi, 4, pp. 232–238, 5 figs., 1931.

Inoculation experiments with *Monilia fioccoi*, the fungus associated with blastomycosis cutis in a case studied by the writer [see preceding abstract], on laboratory animals gave negative

results as far as the development of pathogenic lesions was concerned.

GANDINI (M.). **Micosi faringee e tonsillari da Cryptococcus uvae Pollacci e Nannizzi.** [Pharyngeal and tonsillar mycoses caused by *Cryptococcus uvae* Pollacci & Nannizzi.]—*Att. Ist. Bot. R. Univ. di Pavia*, Ser. IV, ii, pp. 157–171, 2 figs., 1930. [Latin summary.]

Details are given of three cases of pharyngeal and tonsillar mycosis in adult Italian patients caused by *Cryptococcus uvae* [*R.A.M.*, v, p. 609]. In the author's opinion the fungus behaved as a true pathogen in maintaining and aggravating the inflammation. The condition, however, remained localized and being of a mild type readily responded to iodine treatment. The cultural and morphological characters of the fungus are described, and a diagnosis is given in Latin.

NANNIZZI (A.). **Sulla posizione sistematica dei Dermatomiceti.** [On the systematic position of the Dermatomycetes.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, ii, pp. 103–110, 1930. [Latin summary.]

In this paper the author claims to have been the first definitely to have placed the Dermatomycetes among the Gymnoascaceae and to have supported his view with sufficiently numerous facts, including the discovery of the fertile peridium in *Achorion gypseum* [*R.A.M.*, vii, p. 169]. The subsequent researches of Langeron and Milochevitch [ibid., x, p. 242] have done much to elucidate the morphology of these fungi, and are regarded as confirming what the author had previously written concerning their systematic position [ibid., v, p. 553].

KUROTCHKIN (T. J.) & CHUNG (H. L.). **Mycological examination of Peiping orphanages.**—*Nat. Med. Journ. of China*, xvi, 2–3, pp. 171–176, 2 pl. (1 col.), 1930. [Abs. in *Trop. Dis. Bull.*, xxviii, 5, p. 399, 1931.]

The examination of five orphanages, containing 1,555 children at Peiping, China, disclosed the presence of ringworm in all the institutions. In four the disease was very prevalent and in one 90 per cent. of the children were infected. The most common fungus was *Trichophyton violaceum*, two varieties of which were isolated [*R.A.M.*, x, p. 521], followed by an undetermined species of *Trichophyton*. *T. glabrum*, two varieties of *Microsporon ferrugineum* [ibid., x, p. 522], and *Achorion schoenleini* were also encountered.

CATANEI (A.). **Étude d'une teigne de mouton produite par une espèce nouvelle de Trichophyton, T. pruinosum, n. sp.** [A study of a ringworm of sheep caused by a new species of *Trichophyton*, *T. pruinosum* n. sp.]—*Bull. Soc. Path. Exot.*, xxiv, 4, pp. 296–301, 1 pl., 4 figs., 1931.

Trichophyton pruinosum n. sp., isolated from a smooth, squamous ringworm lesion on the forehead of a sheep at the

Institut Pasteur d'Algérie, is characterized by septate hyphae 4 to 4·5 μ in breadth, arthrospores 4 to 10 μ or more in diameter (average 6 to 7 μ) occurring in chains, and intercalary or pediculate chlamydospores. The cultural characters of the fungus on various media are described. Pleomorphism occurred in cultures held at 28° C. Positive results were given by inoculation tests on two sheep, one calf, and two guinea-pigs.

DEUCHLER. **Trichophyton cerebriforme im Konjunktivalsekret.** [*Trichophyton cerebriforme* in the conjunctival secretion.]—*Klin. Mbl. Augenheilk.*, lxxxv, pp. 649–661, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cii, 9–10, p. 232, 1931.]

In seven cases of mild chronic conjunctivitis, all occurring during harvest time (August, 1928), the writer detected the presence of *Trichophyton cerebriforme* [*R.A.M.*, x, p. 243] in the conjunctival secretions. The fungus (a transitional form between the human and animal species of *Trichophyton*) made good growth on dextrose agar and Grütz's modification of Sabouraud's medium [ibid., viii, p. 783]. This is believed to be the first record of trichophytosis exclusively affecting the conjunctiva.

OTA (M.) & KAWATSURÉ (S.). **Inoculabilité au cobaye et immunologie des champignons parasites du genre Endodermophyton Castellani.** [Inoculability into the guinea-pig and immunology of the parasitic fungi belonging to the genus *Endodermophyton* Castellani.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 2, pp. 144–161, 2 pl., 1 fig., 1931.

The authors state that a comparative study of *Endodermophyton tropicale* and *E. indicum* (cultures of which were sent them by Castellani) and of *E. concentricum* isolated by Miyabara in Formosa showed that the three organisms are almost indistinguishable in their morphological and cultural characters; they consider them, therefore, to belong to a single species for which they maintain the name *E. concentricum sensu* Blanchard [*R.A.M.*, ix, p. 243; x, p. 243]. In view, however, of some variations in the clinical aspect of the diseases caused by the organisms in man, they designate them by the terms 'tropical strain', 'Indian strain', and 'Miyabara's strain', respectively. *E. roquettei* [ibid., ix, p. 243] appears to be also very closely related to the other three forms, but in view of its greater virulence and of the difference in the pathological symptoms caused by it, the authors maintain it provisionally as a distinct species.

Inoculation experiments [details of which are given] on the guinea-pig showed that the tropical and Miyabara's strains (but not the Indian strain) of *E. concentricum* and *E. roquettei* caused lesions on this animal, not only the skin but also the hairs being infected. The experiments also indicated that inoculation with one of these species usually immunizes the animal from further inoculations either with the same organism or with a different strain of *Endodermophyton*, and also causes in the animal a defensive reaction against infection with more virulent dermatophytes, e.g.,

Sabouraudites asteroides [*Trichophyton mentagrophytes*: loc. cit.]. There was some evidence that the same is also true in man.

KINNEAR (J.). **Wood's glass in the diagnosis of ringworm.**—*Brit. Med. Journ.*, *1931*, 3670, pp. 791–793, 1931.

The diagnosis of ringworm of the scalp caused by *Microsporon audouini* [*R.A.M.*, x, p. 521] is stated to be greatly simplified by the use of Wood's glass (containing nickel oxide), the light filtered through which imparts a brilliant green fluorescence to the affected hairs. Other forms of ringworm (trichophytosis) cannot be detected by this method with any degree of certainty. Hairs affected by favus (*Achorion schoenleini*) [loc. cit.] show a faint fluorescence through Wood's glass, which is of some value in aiding the diagnosis of this condition.

NETO (V. B.) & MARTINS (C.). **Sur un nouvel agent parasitaire, Scopulariopsis lingualis, isolé dans un cas de mycose de la langue.** [On a new parasitic agent, *Scopulariopsis lingualis*, isolated from a case of mycosis of the tongue.]—*Comptes rendus Soc. de Biol.*, cvii, 12, pp. 1179–1181, 1931.

Morphological and cultural particulars are given of a new species of *Scopulariopsis*, *S. lingualis*, isolated from a case of mycosis of the tongue in Portugal. The mycelium of the fungus is composed of slender, septate hyphae, of variable length, straight or flexuous, mostly simple but sometimes branching dichotomously and bearing round or oval conidia, 1 to 2 μ in diameter. *S. lingualis* develops rapidly on Sabouraud's medium and carrot at 22°C., forming downy, irregular, yellowish-white colonies.

RAMOS Y SILVA (J.). **Sobre um novo caso de 'tinea nigra'.** [On a fresh case of tinea nigra.]—*Brasil-Medico*, xliv, 28, pp. 755–757, 3 figs., 1930. [Abs. in *Trop. Dis. Bull.*, xxviii, 5, pp. 400–401, 1931.]

Infection by *Cladosporium wernecki* is stated to be rare in Brazil [*R.A.M.*, x, p. 523], the first case having been recorded by Horta in 1921, the second by Silva in 1929, while in 1930 Rietmann reported the occurrence of the fungus in the palm of the hand of eight male patients in Salvador (Bahia). In the present paper particulars are given of the case of a laboratory assistant who developed a lesion on the neck shortly after contact with a typical case. The fungus made slow growth on maltose sugar, the colony being 15 to 20 mm. in diameter and 5 mm. high at the end of a month.

JENKINS (ANNA E.). **Development of brown canker of Roses.**—*Journ. Agric. Res.*, xlii, 5, pp. 293–299, 3 pl. (1 col.), 2 figs., 1931.

To supplement the author's previous paper on brown canker of roses (*Diaporthe umbrina*) [*R.A.M.*, vi, p. 553] and to assist in early identification of the disease, a further description (illustrated by a useful coloured plate showing the progressive development of the cankers on rose stems) is given of the symptoms of the conditions.

BINET (L.) & MAGROU (J.). **Glutathion, croissance et cancer des plantes.** [Glutathion, growth, and cancer of plants.]—*Comptes rendus Acad. des Sciences*, cxcii, 22, pp. 1415–1416, 1931.

The authors claim to have demonstrated that the amount of reduced glutathion (a substance composed of one molecule of cystein and one molecule of glutamic acid) [cf. *R.A.M.*, x, p. 396] was considerably greater in actively developing cancerous growths, induced by inoculation with *Bacterium tumefaciens*, on *Pelargonium zonale* (316 to 437 mgm. in 100 gm. tissue) than in the normal leaves and stems of the same host (101 to 222 and 83 to 142 mgm., respectively); the amount of glutathion, however, gradually decreased and finally disappeared as the cancerous growths reached the necrotic stage. The quantity of the substance present in the living tissues would appear to be a function of the rapidity of their development, since in the normal terminal bud of *P. zonale* the amount of glutathion was found to be even greater (500 to 1,000 mgm.) than in the proliferating cancerous tissue.

GUTERMAN (C. E. F.). **Final summary of the work on diseases of Lilies for the Lily disease investigation Fellowship.**—Reprinted from *Hortic. Soc. New York Yearbook*, pp. 51–102, 7 pl., 4 figs., 1930. [Received July, 1931.]

Full, popular notes are given on the symptoms, causes, and control of the chief diseases of lilies present in the United States of America, including mosaic [*R.A.M.*, viii, pp. 310, 577; x, p. 461], blight (*Botrytis elliptica*) [ibid., viii, p. 107], the virus disease known as yellow flat [ibid., x, p. 461], various bulb rots, so-called limber neck, the cause of which remains obscure, rust (*Uromyces holwayi*), frost injury, stump rot due to a species of *Phytophthora* [ibid., ii, p. 306], foot rot (*P. cactorum*) [ibid., v, p. 430], non-infectious chloroses, and a few other diseased conditions that have been reported from time to time.

B. elliptica is the most serious and prevalent of all fungal diseases attacking lilies in the United States, in the eastern regions of which the author did not succeed in finding even one species entirely unaffected. The most susceptible species are *Lilium longiflorum*, *L. candidum*, *L. chalcedonicum*, and *L. testaceum*, while *L. callosum*, *L. concolor*, *L. hansoni*, *L. japonicum*, *L. martagon*, *L. pyrenaicum*, and *L. willmottiae* show resistance. On certain species the leaf spots have light-coloured centres surrounded by a definite reddish-purple margin which grades off into the normal tissue; on others the line of demarcation between healthy and diseased tissue is only a rather dark, water soaked zone. In hot, dry weather the fungus ceases active growth in the leaf tissues, and the spots rapidly dry out, becoming thin, brittle, and characteristically translucent. Stem lesions resemble those on the leaves, while lesions on the buds or flowers are usually brown and more regular in shape than those on the leaves.

Strains of *B. elliptica* were isolated from over 30 species of lilies and with the exception of two non-pathogenic forms, all were equally pathogenic to any species of lily and morphologically

similar, the spore measurements and cultural characters agreeing with those of the European strains.

The chief factors influencing the severity of infection are temperature and moisture. The heavy dews so frequent on Long Island are responsible for the blight epidemics that occur there in summer. Conidia are produced in high atmospheric humidity; in warm dry weather spore production becomes inhibited and further growth in the plant tissues is frequently arrested. Cool night temperatures also assist the fungus to effect penetration. The optimum temperature for infection is 60° F., but the optimum for growth within the host is 70°.

Control consists in the immediate removal and destruction of all diseased material, in using whenever possible the bench soil only once, in keeping the atmospheric humidity in the greenhouses as low as possible, in avoiding excessive watering, and in spraying the plants (particularly when rain is expected, if they are in the open) with Bordeaux mixture 4–4–50. Very serious epidemics are liable to occur in infected greenhouses if wet autumn weather sets in before the heating has been turned on.

Yellow flat was observed by the author on forced *L. longiflorum* bulbs imported into the United States from Japan; it is also present in those regions of the former country where Easter lily bulbs [*L. longiflorum* var. *eximium*] are grown on a commercial scale in the field.

Considerable losses are caused by bulb rots which develop during transit and storage, repeated examinations of bulbs in cases on arrival in America and after being kept in cold storage during the winter revealing losses of from 5 to 100 per cent. The fungi chiefly concerned are *Rhizopus necans*, causing a soft, exceedingly rapid rot at warm temperatures, and a species of *Penicillium* [ibid., vi, p. 16], which appeared to be responsible for the losses sustained by bulbs in cold storage. Good control was given by various [unspecified] organic and inorganic mercury compounds applied in dust form, but some caused injury to the bulbs.

In the eastern parts of the United States *U. holwayi* is only of minor importance on lilies. The affected plants show small, circular or elliptical, powdery, brown pustules (which in severe attacks coalesce into larger areas) chiefly on the under surface of the leaves or along the stems. The fungus passes its whole life-cycle on the lily.

The *Phytophthora* stump rot was observed on *L. longiflorum* vars. *eximium*, *formosum*, and *giganteum* and *L. speciosum* var. *rubrum* growing under glass.

A bibliography of 28 titles is appended.

SCHAFFNER (J. H.). **Injurious fungus parasite of Equisetum.**—*Amer. Fern Journ.*, xxi, 2, p. 75, 1931.

Equisetum praealtum in the vicinity of Columbus, Ohio, is stated to have suffered severely during the past year from the attacks of a Discomycete, *Stamnaria americana* Massee & Morgan, which differs from the European *S. equiseti* in its larger asci and spores. The large patches on the lower internodes spread until the stem is so much injured that the shoot dies. The small cups,

invisible to the naked eye, break out in more or less longitudinal rows; their yellowish-orange colour in a fresh state produces an appearance very similar to that of a rust. Parts of a large patch of *Equisetum* near Columbus have nearly every stalk infected, with a high percentage dead.

DAVIS (W. H.). **Anthracnose, alternariose and Botrytis rot of the Snowberry.**—*Mycologia*, xxiii, 3, pp. 159–190, 5 pl., 5 figs., 1931.

A detailed account is given of the symptoms, and of the morphology, physiology, and taxonomy of the causal organisms, of three diseases which in recent years were very prevalent in the north-eastern United States on the snowberry (*Symphoricarpos albus* [*S. racemosus*] var. *laevigatus*). Anthracnose of the fruit, leaves, and twigs, is caused by a fungus which, on morphological and physiological grounds, was identified as *Glomerella rufomaculans* [*R.A.M.*, ix, p. 765] and in its conidial form as *Gloeosporium rufomaculans* (Berk.) Thüm. [*Glomerella cingulata*: ibid., ix, p. 654]. It causes a dry, mummifying, red to black rot of the berries, and kills some of the young twigs, on which it may produce cankers. The initial infections appear to occur in the bud scales or the bark and the hyphae penetrate the pith and medullary rays of the young stems from which they reach the fruit stalk and pass into the berry. The pathological anatomy of direct attack on the berries is described. The fungus was shown to be able to infect a fairly wide range of other fruits, including apples, pears, grapes, tomatoes, and bananas, but did not attack cranberries. An alternariose of the fruits is frequently associated with the above-mentioned disease. Its cause is identified, mainly on the basis of its physiological behaviour, as *Alternaria solani*, but in view of certain morphological differences exhibited by the fungus on snowberry, the designation forma *symphoricarpi* f. nov. is suggested for it. The berry rot caused by it is soft, watery, and yellow or brown. The third disease is an ochre-yellow rot of the berries caused by a species of *Botrytis* which morphologically agrees fairly well with *B. vulgaris* [*B. cinerea*] as recorded by Saccardo, and still more with the description of *B. furcata* Fries.

PAPE (H.). **Das Auswintern des Klees.** [Winter injury to Clover.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlvi, 12, pp. 233–235; 13, pp. 257–259, 1931.

The most important fungous parasite associated with winter injury to clover in Germany is stated to be *Sclerotinia trifoliorum* [*R.A.M.*, viii, p. 793], which is most severe in relatively mild winters preceded by a rainy autumn; the disease flourishes only under humid conditions, and is rapidly arrested by dry, frosty weather. Observations in Slesvig-Holstein, where the disease is more generally distributed than is commonly supposed, showed that apothecia were completely absent in infected fields of the current year's crops in October and November, 1930, and only a few isolated ones occurred in two-year-old fields; as the diseased new crops were situated a long way from the old fields, the ascospores must either have been conveyed for a considerable distance

through the air or else the apothecial stage must be relatively unimportant in the production of autumn infections.

Recent investigations at the Kiel branch of the Biologische Reichsanstalt have shown that viable sclerotia of *S. trifoliorum* occur in considerable numbers (up to 200 per kg.) in commercial seed. These organs are formed, not only in the root-collar and stem base, but also on and in the stems. In lucerne, in fact, the upper part of the stem may be the sole infected part. In the course of mowing and threshing at harvest time the sclerotia from the stems readily become mixed with the clover seed, which they frequently do not exceed in size. The disease is thus introduced into healthy fields with infected seed, and it may further be disseminated by ascospores or mycelial fragments adhering to the seed itself or occurring in the minute portions of stems, leaves, or pods contaminating the seed. In order to prevent the dissemination of clover rot the seed should be obtained exclusively from healthy fields.

Generally speaking, red clover seems to be the most susceptible to rot, closely followed by crimson [*Trifolium incarnatum*], while kidney vetch [*Anthyllis vulneraria*], white clover, Swedish clover [*T. hybridum*], yellow clover [*T. procumbens*], lucerne, and bird's foot trefoil [*Lotus corniculatus*] are more resistant. Clovers of Italian, French, and American origin are more liable to infection than the native red varieties, e.g., East Prussian, Silesian, and Lembke's. None of the existing varieties appears to be immune from *S. trifoliorum*, and the prospect of developing this character by breeding is complicated by the probable occurrence of biologic strains within the fungus, as indicated by recent Swedish and German investigations [cf. ibid., viii, p. 794]. Clover rot is generally more severe on loose, permeable soils than on those with a firmer texture; it is apt to be more prevalent when the crop is sown among oats than when it accompanies rye.

Other fungi playing a secondary part in the causation of winter injury include *Mitrula sclerotiorum* Rostr., an organism so far observed only in Denmark, the sclerotia of which are stated to be indistinguishable in shape and colour from those of *S. trifoliorum*; *Typhula trifolii*, forming small, dark brown, spherical sclerotia often found among clover seed [ibid., ix, p. 288]; *Fusarium trifolii*, reported from Russia and Switzerland [ibid., vii, p. 380]; a species of *Fusarium* allied to *Gibberella saubinetii*, responsible for root rot of clover and lucerne in the United States; and *Rhizoctonia crocorum* [*Helicobasidium purpureum*: ibid., ix, p. 187], which is the cause of gaps in the lucerne stand.

Notes are also given on some non-parasitic forms of winter injury and on insect pests of clover.

LEISHMAN (E.). **Silver leaf.**—*Journ. Dept. Agric. S. Australia*, xxxiv, 10, pp. 1016–1017, 1 fig., 1931.

The discovery by the author of fruiting bodies of *Stereum purpureum* on plum and apple trees in several localities of the Hills district of South Australia is circumstantial evidence that the silvering of the leaves of these trees which has in recent years attracted the attention of fruit growers in that district, is due to

this fungus. A similar condition of cherry trees is also believed to be caused by it, although no fruiting bodies have yet been found on them. Recommendations are made for the control of the disease.

HAMILTON (J. M.). **Studies of the fungicidal action of certain dusts and sprays in the control of Apple Scab.**—*Phytopath.*, xxi, 5, pp. 445–523, 3 figs., 4 graphs, 1931.

This is a very detailed account, accompanied by nine tables, of the author's experiments, carried out in the greenhouse under controlled conditions, at the Wisconsin Agricultural Experiment Station on the control of apple scab (*Venturia inaequalis*) by a number of proprietary and other fungicides, notes on the composition of which are given. Each test was made on two young healthy apple trees in pots, which were infected by placing ascospore material over the plants in specially constructed moist chambers, the discharge being checked by slides.

All the fungicides applied before inoculation gave excellent control, but variations in efficacy were apparent when they were applied after inoculation. Sprays containing lime-sulphur were found to be more effective than the sulphur dusts (whether finely ground, sublimed, 'activated', or combined with lead arsenate), wettable sulphur sprays, calcium monosulphide, Bordeaux mixture, emulsified oils with or without a sulphur fungicide, and the mercury compounds [cf. above, p. 644]. There was little indication of control by sulphur-arsenate dust 90–10 applied later than about 12 hours after inoculation, unless the application was followed by a moist treatment, whereas sprays containing lime-sulphur, especially lime-sulphur 1 in 40 plus lead arsenate 1 in 50, gave good control when applied 30 to 72 hours or even longer after inoculation. Bordeaux mixture gave consistent control and proved more efficacious than certain sulphur dusts or finely divided sulphur sprays. Good results were also given by emulsified oil L 202 (Standard Oil Company, Indiana) applied 46 to 72 hours after inoculation. Kolodust 8–50, kolotex 8–50 [ibid., viii, p. 652], and bentonite sulphur 5–50 [ibid., x, p. 533], applied in a 2 per cent. emulsified oil (L 202 or L 20) after incubation periods of 30 to 72 hours, or in 1 per cent. soft soap after 48, 72, and 30 hours, respectively, were decidedly more efficient than when used alone as dust or sprays. The mercurial compounds K-1-CB (Bayer-Semesan Co., Inc.), 177 C, 117 E, and 118 (Corona Chemical Division, Pittsburgh Plate Glass Co.) proved effective in the 2 per cent. oil emulsion L 20, applied 24 to 30 hours after inoculation.

The quantity of ascosporic inoculum was a factor in the efficacy of sulphur fungicides applied after inoculation. The control of the fungus was not materially influenced by a temperature range from 6° to 23° C., but temperatures above 26° assisted considerably in the inhibition of the organism. Histological evidence indicates that *V. inaequalis* may be effectively controlled even after infection has taken place, and from unpublished data available it appears that prompt spraying after critical infection periods should be of much value in cases of emergency. The action of lime-sulphur, however, was apparently more rapid when the

application was made at or shortly after inoculation than when the treatment was given some time later.

A moist treatment following the application of sulphur-lead arsenate dusts or sprays after infection appeared to increase the efficacy of these materials. The enhanced fungicidal action of lime-sulphur resultant on the admixture of lead arsenate is attributable, at any rate in part, to soluble arsenic. There was no injury in these experiments when soluble arsenic was applied alone at a strength of 0·04 per cent. or with lime-sulphur 1 in 40 at 0·03 per cent. Lime-sulphur plus kayso plus lead arsenate seemed to be the most effective of the combinations tested.

The development of the conidia of *V. inaequalis* on leaf lesions was checked in accordance with the fungicidal efficacy and adhesiveness of the materials used; some fungicides may be more or less effective for the greater part of the season. The efficacy of the sulphur preparations and Bordeaux extended over a wider area than the actual surface covered. No significant increase in the fungicidal efficacy of sulphur resulted from an admixture of potassium permanganate as an oxidizing agent [ibid., ix, p. 734].

Lime-sulphur sprays and Bordeaux mixture were found to be decidedly more adhesive than certain sulphur dusts, finely divided sulphur sprays, emulsified oils, and other preparations tested. Sulphur dust was rendered ineffective by a short period of rain or washing treatment, while the lime-sulphur spray continued to exert a protective action after heavy rain or protracted washing. The addition of spreaders, e.g., soft soap, emulsified oil, kayso, and ferric oxide, increased the adhesiveness of certain fungicides to a varying extent.

Laboratory studies confirmed the greenhouse results as regards the inhibitory action of sulphur on *V. inaequalis*, the action of sulphur other than by contact, the fungicidal efficacy of precipitated (aërated) lime-sulphur, certain temperature relationships, and the toxic effect of lead arsenate and soluble arsenic on the fungus.

LOEWEL. **Ein Schädlingsbekämpfungsversuch.** [An experiment in pest control.]—*Obst- und Gemüsebau*, lxxvii, 5, pp. 78–79, 1931.

Notes are given on experiments in the control of *Fusicladium* [*Venturia inaequalis*] on the Horneburger Pflannkuchen apple variety in the Alteland district of Hamburg [*R.A.M.*, vii, p. 520]. The highest percentage (84·2) of scab-free fruits was found on the plots given three applications of Bordeaux mixture, while nosprasit came next with 78·2 per cent. [cf. ibid., ix, p. 790]. The latter preparation possesses the advantage of causing no leaf scorch, which was very severe in the Bordeaux-treated plots. Neither nosperit nor lime-sulphur gave adequate control.

ADAMS (J. F.). **Some recent results in spraying Apples.**—*Trans. Peninsular Hort. Soc. (1930)*, xx, 5, pp. 98–110, 1930.

A progress report is given of spraying tests conducted for a period of two years in Delaware to compare the efficacy in the con-

trol of certain apple diseases of some of the newer spray materials, in comparison with the standard fungicides recommended.

In discussing the results obtained the author points out that weather conditions affect the efficiency of the sprays as well as the prevalence of the diseases. Definite strengths of spray materials which must be maintained at certain periods may be diluted at other times. Against apple scab [*Venturia inaequalis*] dilution is justifiable only in order to minimize the risk of russeting and foliage burning and should never be made unless weather unfavourable to the fungus is expected. While cold, damp weather favours lime-sulphur injury, similar effects also result if the same concentration is maintained in hot, dry weather. The addition of iron sulphate or aluminium sulphate to lime-sulphur [*R.A.M.*, x, p. 255] gave conflicting results, while fish oil reduced the efficacy of lime-sulphur in the control of black rot [*Physalospora cydoniae*] and fruit spot [*Phoma pomi*] on all the varieties tried except Stayman and also impaired the control of scab on Paragon and Transparent apples, while on Stayman and Grimes the mixture produced more russeting than did ordinary lime-sulphur. Certain oil spreaders in combination with copper sprays gave similarly conflicting results, as did hydrated lime with various standard sprays. In exceptionally dry weather sulphur sprays gave nearly as good control of blotch [*Phyllosticta solitaria*] and bitter rot [*Glomerella cingulata*] as did copper sprays, and even better control of *V. inaequalis*. In some seasons, weak solutions of copper sprays used to control *Phoma pomi* caused such russeting that the losses were heavier than those which the disease itself would have produced. Copper injury on foliage appeared to decrease in dry seasons and increase in wet ones.

The stationary sprayer—its value and place in the Pacific Northwest.—*Better Fruit*, xxv, 7, pp. 5–6, 21, 1 fig., 1 diag., 1931.

In describing the many advantages attaching to the use of stationary spray installations [*R.A.M.*, ix, p. 791] in large orchards the author points out that in the long run it is often cheaper to purchase a larger plant than is required at the time, as allowance should be made for a possible increase in the area to be sprayed. Double compartments or two large tanks should be used with the larger sprayers in order that one compartment or large tank may be filled with water and the chemicals mixed while the other is being used for spraying. A considerable saving in the cost of piping can sometimes be effected by placing the plant in the middle of the orchard and so using the least possible length of large pipe. If possible, the piping should be laid underground; overhead piping is liable to sag when the props are removed, and piping laid along the ground has to be removed when harvesting, etc., is in progress. American growers agree that for large orchards a stationary plant costs no more, or even less, than does the number of portable outfits that would be required to be equally effective; in orchards of 5 to 12 acres stationary sprayers show a saving as compared with portable ones, since one man suffices to perform the spraying. Stationary sprayers are most economically

driven by electric power, or if this is not available, by a petrol engine.

A stationary installation, besides eliminating the expense of hauling the spray fluid through the orchard, also enables the spray to be applied promptly to time even when the weather has made the condition of the soil so bad that a portable spray would be useless, with a resultant loss to the grower possibly greater than the cost of the stationary plant. Further, a stationary sprayer does the work at approximately twice the speed of an equivalent number of portable sprayers, and costs very much less in depreciation.

De Long (W. A.) & Pickett (A. D.). **On a possible effect of fungicides upon the composition of Apples.**—*Science*, N.S., lxxiii, 1902, pp. 649–650, 1931.

The fact that differences in flavour enabled sprayed and unsprayed fruit to be differentiated occasioned the authors to make a chemical study of the composition of such fruit. The results [which are tabulated] of preliminary analyses of Northern Spy and Ribston Pippin apples receiving various fungicidal treatments in Nova Scotia indicated that fruit treated with sulphur preparations during the growing season possessed, at the time of analysis (19th December, 1930, and 3rd January, 1931), a slightly lower reducing power, both of the alcoholic extract and of the alcohol-insoluble residue after hydrolysis, than unsprayed apples or those treated with Bordeaux mixture.

Heald (F. D.) & Ruehle (G. D.). **The rots of Washington Apples in cold storage.**—*Washington Agric. Exper. Stat. Bull.* 253 (*Tech. Paper*), 48 pp., 13 figs., 1931.

Notes are given on over 40 species of fungi belonging to 22 genera which have been recorded in connexion with the rotting of apples in cold storage in Washington [*R.A.M.*, x, p. 226]. Blue mould (*Penicillium expansum* and other species) is believed to be responsible for at least 75 per cent. of storage rot except in the north-west, where perennial canker or bull's eye rot (*Gloeosporium perennans*) is specially prevalent. *P. expansum* was found to rot apple tissue almost twice as quickly as any of the other blue moulds isolated, and about nine times more rapidly than the slowest growing species.

G. perennans, which is most severe in rainy seasons, causing 60 per cent. infection in the White Salmon section in 1927, appears chiefly to affect the Jonathan, Yellow Newtown, and Spitzenberg varieties in the district in question, though it has been found also on Rome, Winesap, and Delicious in other places. At cold storage temperatures the rotted areas produced by inoculation measured 30 to 45 mm. in diameter after four months. At 68° F. the lesions at first developed slowly but after a month they expanded quickly.

The dark lesions caused by *Alternaria tenuis* and *A. mali* develop rapidly on ripe fruit at 77°, the whole apple sometimes being involved in two months. At cold storage temperatures, however, the growth of these organisms is very slow; the spots

are black, shallow, and dry, and below the epidermis is a cavity more or less completely filled with the dark hyphae of the fungi mixed with fragments of dead host cells. The lesions produced by *Pleospora fructicola* nom. nov. (*P. mali* Newton) and *Stemphylium congestum* [ibid., x, p. 321], of which the former is stated to be the more common, closely resemble those of *Alternaria*.

Sporotrichum malorum was first observed in Washington in 1926. The light to dark brown lesions develop very slowly at cold storage temperatures; the fungus has generally been found in late storage rots on mature fruit. *S. carpogenum* produces a similar type of decay to that caused by *S. malorum*, but is less common.

At 77° grey mould (*Botrytis cinerea*) produces a very rapid decay of ripe apples, entirely destroying the fruit in 20 days, while in cold storage rotting is two to three times as rapid as that caused by blue mould. The so-called 'spot rot', in which many of the lenticels in the rotted areas are surrounded by a darker brown ring, developed only in lots held at 60°. *B. mali* is capable of producing a rapid decay similar to that caused by *B. cinerea*. It is much less common than the latter, develops slightly less rapidly at all temperatures, and does not cause the lenticel spotting referred to above.

The soft, watery, light brown rot due to *Mucor piriformis* was found early in the season on Jonathan apples from Wenatchee. *M. piriformis* develops even more rapidly than blue mould and sporulates freely at temperatures near 32°; its relative scarcity is thought to be due to the fact that the spores are much less numerous and less tolerant of adverse conditions than those of *P. expansum*. The rot caused by *Rhizopus nigricans* is stated to be practically indistinguishable from that of *M. piriformis*, but the former was unable to cause decay of ripe Jonathans at cold storage temperatures.

Mycosphaerella tulasnei (*Cladosporium herbarum*) and *Hormodendrum cladosporioides* were found to form black lesions, 8 to 10 mm. in diameter, after three months in cold storage. At 68° to 77° ripe Jonathans developed dark brown to black, firm lesions reaching a maximum diameter of 25 mm. in three months. There were usually cavities under the skin containing dark hyphae. *C. malorum* grew much more actively on sound ripe apples at high temperatures, forming lesions 20 to 30 mm. in diameter in 14 days at 68° to 77°; in cold storage, however, its rate of advance approximated to that of the two foregoing species.

Phoma Nos. 1 and 2, isolated from Yellow Newtowns and Winesaps, respectively, produce brown, fairly firm lesions, with pycnidia just below the surface in the former case. At 68° the lesions caused by No. 1 reached a diameter of 15 to 45 mm. in a month, and those of No. 2, 7 to 10 mm., the corresponding figures at 30° to 35° being 22 to 50 and 0 mm., respectively. *Coniothyrium* Nos. 1 and 2 are characterized by much larger spores than any species hitherto isolated from apple and may be new. The lesions are dark brown and firm; neither species caused decay at cold storage temperatures. Pycnidia were not formed on the surface of rotted tissue by either species, but were produced in abundance

by No. 1 on the surface of sterilized apple bark or wood in culture. A species of *Microdiplodia* has been isolated a number of times from small, dark brown, firm lesions, and was found capable of producing a brown, firm, shallow rot developing slowly at 77°.

A characteristic sweet odour emanates from fruit infected by the *Hypochnus* or fish-eye rot (*Corticium centrifugum*) [see below, p. 681], as well as from cultures of the fungus, the clamp-connexions in the mycelium of which also furnish an easy means of identification. Although found only on Winesaps in storage, this fungus proved to be capable of infecting Jonathan, Rome, and Spitzenberg in inoculation tests.

Fusarium No. 1 produced firm, light brown lesions (tan in the centre with a darker edge) resembling the 'bull's-eye' type associated with *C. centrifugum* and *G. perennans*. *F.* No. 2 produced firm lesions of a uniformly light brown colour, and *Ramularia magnusiana* also causes a similar rot. An unidentified species of *Ramularia* causes a fairly rapid, light brown, moderately firm rot at 68°. *Coryneum foliicolum* is a weak parasite both at cold storage temperatures and at 77°, causing eventual mummification at the latter point. The superficial, firm lesions are dark brown to nearly black. At 77° *Pestalozzia hartigii* produces circular, fairly firm, light brown, smooth lesions, measuring 30 to 35 mm. in 21 days and involving the whole apple in three months. At cold storage temperatures the rate of progress is slower but finally the fruit is completely destroyed. The shallow, brown, firm spots produced by *Oospora* sp. measure 10 mm. after six weeks at 68°. Similar lesions caused by *Cephalosporium carpogenum* n. sp. attain a diameter of 20 mm. in two months at 68°. *Epicoccum granulatum* is the cause of a firm, dry, reddish-brown rot on Jonathans, the lesions measuring 20 to 25 mm. after two months at 68° and 10 to 35 mm. after five months in cold storage.

The modes of infection by storage rots, the temperature relations of the fungi concerned, and various measures of prevention or control are discussed.

BENNETT (J. P.). **The treatment of lime-induced chlorosis with iron salts.**—*California Agric. Exper. Stat. Circ.* 321, 12 pp., 1 diag., 1931.

Directions are given for the treatment, by means of iron salts, of chlorosis in fruit (especially pear) and other trees induced by an excess of lime in the soil [cf. *R.A.M.*, ix, p. 501; x, p. 56]. Where only a few plants are to be treated, a solution of ferrous sulphate (1 oz. per gall.), with a teaspoonful of liquid glue as a spreader, may be sprayed on the leaves, preferably late in the day so that the solution will not dry and the iron may be absorbed during the night. In the trench method, trenches several inches wide are dug round the tree to a depth of 1 to 2 ft., and one to several feet from the base so as to expose many small roots. Ferrous sulphate, crushed so that the largest lumps are about half-an-inch in diameter, is strewn along the bottom of the trench. The same treatment may be applied by boring holes in the soil, about 2 in. in diameter, 1 to 2 ft. deep, and 2 to 3 ft. apart, in one or more rings spaced from one to several feet distant from the

trunk. Late winter or early spring are the best times for the application of this treatment.

Another mode of procedure consists in the injection of any soluble iron salt (1 oz. per gall.) into the tree. In trees up to 6 in. in diameter a single hole, $\frac{1}{4}$ to $\frac{3}{8}$ in. in diameter, is bored about two-thirds to three-quarters through the trunk; a short length of threaded pipe is screwed tightly into the hole and above this a suitable reservoir is attached either directly or by a rubber tube. The iron solution is placed in this reservoir in an amount proportionate to the size of the tree. Air must be displaced from the hole and connexions by filling these with the solution before attaching the reservoir. For larger trees two or more such reservoirs are attached separately to holes bored parallel to each other from one side of the tree at the same level and 3 to 4 in. apart, or to holes bored towards the centre of the tree to a depth of 4 to 6 in. and at intervals of 6 to 8 in. round the tree. The holes may also be bored in the larger roots, in the base of the trunk below soil level, or in the branches. After treatment they are covered with grafting wax. This treatment should also be applied during the dormant season.

The iron salts may also be introduced into the tree in a dry form through $\frac{1}{4}$ to $\frac{7}{16}$-inch holes, 1 to 3 in. deep, in the larger roots, the trunk, or the branches, bored at intervals of 3 to 4 in. Ferrous and ferric citrate, at the rate of $\frac{1}{100}$ to $\frac{1}{8}$ oz. per hole, are specially recommended for this purpose. The former costs about 75 cents. and the latter \$1·25 to 1·75 per lb. The dry salt method is stated to have been successfully applied to some 75,000 pear trees in California.

REINECKE (O. S. H.). **Die-back of fruit trees in the Western Cape Province.**—*S. Africa Dept. of Agric. Bull.* 97, 16 pp., 4 figs., 1 graph, 1931.

An account is given in popular terms of a die-back of deciduous fruit trees and especially of peaches which has led to considerable losses during recent years in Cape Colony.

In many peach varieties the processes of growth renewal have not been normal; in extreme cases, as seen in the Early Alexander and Champion varieties, the flower buds form an absciss layer before they unfold, dropping to the ground when the tree should be in flower. In other varieties the blossoming period is delayed while most of the buds drop or develop into weak flowers which either do not set or form small fruits which soon drop. Most of the leaf buds drop before the leaves develop, but a few, including the terminal one, form a weakly cluster of small leaves. The result is an unsightly tree with an outer fringe of bare-necked shoots mostly crowned with a tuft of small leaves. When the condition is very bad the trees remain in this semi-dormant state until the end of November, when the large branches and even whole trees die back. More often, however, new shoots form profusely during November on wood not less than two years old, a luxuriant growth tending by the middle of summer to mask the poor growth previously in evidence. In other varieties sufficient

flower buds survive to yield a moderate crop, and there is a sufficient leafage area to nourish the surviving fruits.

The condition is attributed to the abnormal weather conditions which have prevailed in Cape Colony since 1926, the rainfall having been well below the average, while in 1927, 1928, and 1930 the average maximum and minimum temperatures were high, and desiccating north-earterly and easterly winds prevailed in 1928 and 1930.

BERGAMASCHI (MARIA). **Una nuova malattia dei frutti del Susino.** [A new disease of Plum fruits.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, ii, pp. 89–92, 2 figs., 1930. [Latin summary].

In July, 1930, the author received plum fruits showing a severe bruising which extended over about half the surface and took the form of a sunken black area; the skin became soft and wrinkled and the pulp first softened, and then hardened and shrivelled up. The yellow, disintegrated cells of the pulp and skin contained hyaline, contorted, pluricellular hyphae 3·3 to 5·6 μ in diameter and with short segments, which formed a compact, abundant stroma on the surface of the fruit. From this arose thick bundles of hyphae, the tips of which showed a club-shaped swelling, like basidia. The apical part, which was sometimes bifurcate, measured 23 to 25 by 8 to 8·5 μ and bore 1 to 7 apically inserted conidia (? basidiospores) on short sterigmata. The conidia measured 6 to 6·5 by 2 to 2·5 μ and were hyaline, elliptical, straight or curved on one side. These characters agree with the description of *Microstroma tonellianum* previously reported on plum leaves [*R.A.M.*, ii, p. 166]. At the same time, both in its morphological characters and the symptoms produced the fungus also resembles *Aureobasidium vitis*, of which a var. *album* is known [ibid., ii, pp. 152, 167].

In view of the uncertain systematic position of the genus *Microstroma* [ibid., ix, p. 275; x, p. 494], further studies of this fungus are contemplated.

SCHLÖSSER (J.). **Schnitt der Schattenmorellen als Mittel zur Bekämpfung der Monilia.** [Pruning of shade Morellos as a means of control of *Monilia*.]—*Obst- und Gemüsebau*, lxxvii, 5, pp. 77–78, 1931.

The author's extensive field investigations near Cologne, on the life-history of the *Monilia* attacking shade Morellos [*Sclerotinia cinerea*: *R.A.M.*, ix, p. 662], which in two years reduced his yield from 700 to 20 cwt., have shown that infection begins at harvest time. Spraying should therefore be begun immediately after harvest and a 0·5 per cent. carbolic acid solution has been found to give satisfactory control. The cost of 100 l. of this solution is Pf. 40 to 75. Pruning is a valuable adjunct to spraying in the control of *S. cinerea*, but by itself is not adequate for this purpose.

SMITH (R. E.) & HANSEN (H. N.). **Fruit spoilage diseases of Figs.**—*California Agric. Exper. Stat. Bull.* 506, 84 pp., 47 figs., 1931.

This is a comprehensive account of the available information on

various diseases contributing to the excessive spoilage of the Californian fig crop in recent years, including souring (due to fermentation of the internal saccharine juices caused by specific yeasts), endosepsis (*Fusarium moniliforme* var. *fici*) [*R.A.M.*, viii, p. 584], mould (associated with the presence of species of *Aspergillus*, *Hormodendrum*, *Cladosporium*, *Rhizopus*, and other fungi), 'smut' (*Aspergillus niger*) [ibid., iv, p. 619], and mildew or black spot (*Alternaria* sp.).

WARDLAW (C. W.). **Fusarium cubense.**—*Trop. Agriculture*, viii, 3, pp. 54–60, 1 pl. (opposite p. 72), 1931.

The author describes the cultural characters shown by five strains of *Fusarium cubense* (including Reinking's strain No. 15 and one from the Centraalbureau voor Schimmelcultures, Holland, beside Trinidad strains) and one of *F. oxysporum* (also from the Centraalbureau), when grown under uniform conditions on standard media. Important differences were observed in vegetative growth, colour production, the formation of chlamydospores and sclerotia, and in the nature of the sporulation. No two strains were identical.

The various strains of *F. cubense* selected represented separate isolations from bananas affected with Panama disease. It was ascertained that the classification of the strains varied with the characteristic adopted as its basis, e.g., on the basis of sporulation one grouping would be effected, on chlamydospore formation another, and so on. These findings were confirmed when a comparative examination of a collection of some 60 isolations was made. A striking range of variation was shown by the different strains, and when the basis of comparison was extended by using a sufficient number of different culture media, a rigid grouping became impossible if all the cultural characters were considered. The author considers that the natural classification of this group will be beset with difficulty until the pathogenicity as well as the morphology is more fully investigated.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1930.** [Bibliography of plant protection literature for the year 1930.]—*Biol. Reichsanst. für Land- und Forstwirtsch., Berlin-Dahlem*, 245 pp., 1931.

This bibliography of German and foreign literature published during 1930 on different aspects of phytopathology and plant protection has been compiled on the usual lines [*R.A.M.*, ix, p. 735].

DOIDGE (E[THEL] M.) & BOTTOMLEY (A[VERIL] M.). **A revised list of plant diseases occurring in South Africa.**—*Botanical Survey of South Africa Mem.* 11, 78 pp., 1931.

Undertaken in accordance with a resolution passed at the Imperial Agricultural Research Conference held in London in 1927, this revised list of plant diseases recorded in South Africa is based on a similar, preliminary list issued in 1924 [*R.A.M.*, iii, p. 745]. The accuracy of certain doubtful records appearing in the earlier publication has now been checked, some inaccuracies have been eliminated, and a number of new records have been

added. A conspicuous feature of the present list is the large number of wilt diseases and crown and root rots attributed to species of *Fusarium*.

The diseases are listed under their popular names according to the host, and the name of the causal organism is given when known. Brief notes are made on their distribution, symptoms and severity, and an index of the hosts and parasites mentioned, under their scientific names, is appended.

BITANCOURT (A. A.). **Doenças cryptogamicas das plantas cultivadas.** [Cryptogamic diseases of cultivated plants.]—*Agronomia* (*Ann. Soc. Brasil. Agron.*), i, pp. 239–253, 1930. [Received July, 1931.]

Popular notes are given on the etiology and control of some important fungous diseases of cultivated plants in Brazil. The paper terminates with an abbreviated list of the principal fungi attacking the various crops (including coffee, sugar-cane, cotton, cacao, citrus, vine, and wheat), both scientific and popular names being given.

AMELUNG (H.). **Über die durch Abwasserpilze verursachten Schäden.** [On the damage caused by drain fungi.]—*Chem. Zeit.*, lv, 41, p. 394, 1931.

Very heavy damage is stated to be caused in Germany by *Sphaerotilus natans* and *Leptomitus lacteus*, which are prevalent in the drainage systems of sugar and paper factories, breweries, dairies, and in short, near all places the effluent from which affords organic nitrogen compounds for their nutriment. The organisms are more abundant in the winter than during the summer months and occur chiefly in running water. The obstruction of conduits, valves, water-wheels, turbines, and the like, may be responsible for serious accidents, besides pecuniary loss which in one electrical works was estimated at M. 130,000. The damage caused by these organisms is by no means confined to the immediate vicinity of the factories but may extend down stream for 50 km. or more; fishing activities also suffer considerably. Only a limited degree of success has hitherto been obtained in attempted control by the use of chlorine, chloramine, or compounds of chlorine and copper.

TOBLER (F.). **Untersuchungen und Betrachtungen über Immunität und Immunisierung im Pflanzenreich.** [Investigations and reflections on immunity and immunization in the vegetable kingdom.]—*Naturwissensch.*, xix, 20, pp. 413–416, 1931.

The author traces the evolution of the concept of immunity (specific and non-specific, innate and acquired, active and passive, general and local) in the plant world, giving a number of examples from the current literature. Some general observations are made on the subject of immunization with special reference to the serological experiments of Arnaudi and Carbone in Italy [*R.A.M.*, ix, p. 330], and the importance of this and kindred lines of investigation in the control of plant diseases is discussed.

Fawcett (H. S.). **The importance of investigations on the effects of known mixtures of microorganisms.**—*Phytopath.*, xxi, 5, pp. 545–550, 1931.

The writer presents some general considerations, accompanied by a number of examples from current phytopathological literature, in support of his view that more attention should be paid to the effects of known mixtures of fungi as compared with the action of individual organisms in relation to plant diseases. In his opinion, many plant diseases are probably influenced by associated organisms to a much greater extent than is yet realized, both as to the inhibition and acceleration of the processes of infection. Work with mixtures, therefore, may throw much light on relationships which are unlikely to be discovered by the use of pure cultures of single organisms.

Endo (S.). **Studies on the antagonism of microorganisms. I. Growth of Hypochnus centrifugus Tul. as influenced by the antagonistic action of other microorganisms.**—*Bull. Miyazaki Coll. Agric. & Forestry*, 3, pp. 95–119, 1 pl., 1931. [Japanese summary.]

The results [which are tabulated and discussed] of experiments on the antagonistic action of 26 species of bacteria and 62 species of fungi on the growth of *Hypochnus centrifugus* [*Corticium centrifugum*: see above, pp. 626, 676] in culture media or in the soil showed that the development of this organism is retarded in varying degrees by the following, among others: *Bacillus aroideae*, *Bacterium medicaginis*, *Bact. sojae*, *Bact.* [*Pseudomonas*] *syringae*, *Bact.* [*P.*] *citri*, *Bact. beticola* [*R.A.M.*, x, p. 424], *Bact. tumefaciens*, various strains of *Aspergillus niger*, *A. parasiticus* [ibid., ix, p. 766], *A. schiemanni*, *A. tamarii*, and *A. violaceo-fuscus*. The sclerotia of *C. centrifugum* are killed by the antagonistic bacteria tested in 21 days at 28° C. on culture media, and in the same time at 24°, 28°, and 32° in the soil.

Kotila (J. E.). **Experiments with the tuber index method of controlling virus diseases of Potatoes.**—*Michigan Agric. Exper. Stat. Tech. Bull.* 117, 26 pp., 7 figs., 4 diags., 1931.

In order to develop seed potato stock free from virus diseases, healthy tubers were selected by the tuber index method, and these tubers were increased under isolated conditions until sufficient quantities were obtained for release to growers of seed potatoes in Michigan [cf. *R.A.M.*, viii, p. 395]. Over 9,000 bushels of single tuber clone stock were produced on Michigan farms during 1929, compared with 3,000 in 1928. The best results in tuber indexing were obtained during January, February, and March in greenhouses kept at a temperature of 65° during the day and a little lower at night. The proper isolation of increase plots in a region where the prevailing conditions are very favourable to potato development was found to be the chief factor concerned in the maintenance of the health of potato seed stocks. The results of three seasons' tests in two localities with widely different environmental conditions indicate no appreciable differences in productivity of different single tuber clones of given varieties. They further

show that, under the favourable conditions of the Upper Peninsula, there is no significant difference between the yielding capacities of clones of early and late varieties.

KOCH (K.). **The Potato rugose mosaic complex.**—*Science*, N.S., lxxiii, 1901, p. 615, 1931.

Working with Johnson's viruses [*R.A.M.*, vi, p. 501; viii, p. 592] at Wisconsin University, the writer has found that rugose mosaic of potato, which is identical with spot necrosis of tobacco, is caused by a combination of two distinct viruses [ibid., x, p. 410]. One of these is the 'mottle' or 'healthy potato' virus [ibid., ix, p. 402], which is normally present in apparently healthy potatoes of most, if not all, standard American varieties. This virus is readily transmissible by plant extract but not by aphids, while the other virus in the complex is transmitted in both ways. On young Havana tobacco plants the symptoms of the aphid-transmitted virus are often faint, usually consisting only of a clearing of the veins and general flattening of the plant.

The aphid-transmitted virus may be separated from the rugose mosaic or spot necrosis complex by means of the aphids *Myzus persicae* or *Macrosiphum solanifolii* [*M. gei*]. The mottle virus may be separated from the complex by various means but it can also be readily obtained, free of the aphid-transmitted virus, from apparently healthy potatoes. A combination of these viruses produces the typical spot necrosis on tobacco or rugose mosaic on potato. When only the insect-transmitted virus is inoculated into the American Bliss Triumph potato, typical rugose mosaic results since the mottle virus is already present. On the other hand, the transmission of the former virus to tobacco will not produce spot necrosis unless the mottle virus is artificially introduced. In the absence of the mottle virus, e.g., in certain foreign potato varieties, aphid transmission will fail to produce the typical rugose mosaic, though artificial inoculation will be successful.

EICHINGER. **Abbau der Kartoffel und Kalidüngung. Eine Kritik.** [Degeneration of the Potato and fertilizing with potash. A criticism.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, vii, 10, pp. 308–310, 1931.

Objections are raised to Wartenberg's view that potato degeneration is due to the excessive absorption of mineral salts, especially potash [*R.A.M.*, x, p. 542]. The technique of the experiments is criticized on various grounds, and the results are considered to be entirely misleading.

MERKENSCHLAGER (F.). **Düngung und Abbau. Eine Erwiderung.** [Fertilizing and degeneration. A reply.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht.*, vii, 10, pp. 310–311, 1931.

Replying to Eichinger's criticisms of Wartenberg's views on potato degeneration [see preceding abstract], the writer points out that the investigations on the effects of potash fertilization form part of a comprehensive study on the biology of the potato, and should not be judged as a separate item.

KOLTERMANN (A.). **Das Auftreten des Pulverschorfes der Kartoffeln, Spongospora subterranea (Wallr.) Johnson, in Pommern.** [The occurrence of powdery scab of the Potato, *Spongospora subterranea* (Wallr.) Johnson, in Pomerania.]—*Fortschr. der Landw.*, vi, 9, pp. 292–295, 2 figs., 1931.

In Pomerania powdery scab of potatoes (*Spongospora subterranea*) [*R.A.M.*, x, p. 402] only occurs in allotments and plots in which the crop is cultivated continuously, and it is often found in association with wart disease (*Synchytrium endobioticum*). Infection has only been observed on the tubers and seldom takes the severe form of 'deep' scab, the pustules usually being superficial. The affected varieties include Erdgold, Rosafolia, Wohltmann, Odenwälder Blaue, and Sickingen. A correlation appears to exist between a heavy rainfall in June and the first ten days or so of July and a high incidence of powdery scab.

Working on powdery scab in Switzerland, Nora Wild found that the spore balls of *S. subterranea* do not develop until the tubers are placed in storage [cf. ibid., ix, p. 264], but the writer detected them at harvest time. There is some evidence that the fungus persists in the soil where crop rotation is not practised, but there is considered to be little or no risk of its spreading to the potato fields under Pomeranian conditions, and no special control measures are thought to be necessary. The fungus is probably not indigenous in Pomeranian soils, but is introduced from time to time with consignments of diseased material.

KÖHLER (E.). **Neue Untersuchungen über den Kartoffelkrebs.** [New investigations on Potato wart.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 5, pp. 35-36, 1931.

Recent investigations on the phenomenon of 'subinfection' in wart disease of potatoes [*Synchytrium endobioticum*: *R.A.M.*, vi, p. 503] in Germany have shown that the small necrotic lesions characteristic of abortive infection occur in all the genuinely immune varieties. When the tubers are examined 14 days after inoculation the necrotic areas, which develop 2 to 3 days after infection has taken place, have usually disappeared, hence the frequent failure to detect them. In the resistant varieties the fungus forms extensive dark brown, necrotic areas, but here again it fails to reach maturity. In more susceptible varieties the necrotic areas generally appear later, i.e., the parasite remains alive longer than in the resistant ones, while in highly susceptible varieties necrosis is ordinarily absent. The fact that a high degree of resistance may be recognized within two or three days by the development of necrotic areas is of importance in the testing of varieties for immunity.

NEUMANN (H.). **Prüfung von Kartoffelsorten auf ihre Widerstandsfähigkeit gegen Kartoffelkrebs (Synchytrium endobioticum).** [Testing of Potato varieties for their resistance to Potato wart (*Synchytrium endobioticum*).]—*Oesterr. Zeitschr. für Kartoffelbau, 1931*, 2, pp. 29–33, 1931.

Lemmerzahl's method of testing the reaction of potato tubers to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, x, p. 335]

has given eminently satisfactory results at the Vienna Plant Protection Institute. Out of 4 tests with samples of Böhm's Allerfrüheste potatoes 100 per cent. infection was obtained in 3 and 80 per cent. in 1, 100 per cent. infection was given in 2 tests with Alma, and 80 per cent. in 1 with Prof. Wohltmann.

Neue krebsfeste Kartoffelsorten. [New wart-immune Potato varieties.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931,* 2, pp. 37–41, 1931.

A list is given of 98 potato varieties officially recognized by the German Plant Protection Service (Jannary, 1931) as immune from wart disease [*Synchytrium endobioticum*]. The susceptible varieties are also enumerated.

CHEVALIER (A.). **Sur une Ustilaginée parasite du Riz en Afrique Occidentale.** [Note on a species of Ustilagineae parasitic on Rice in West Africa.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xi, 116, p. 275, 1931.

The author states that rice (presumably originally imported from America) cultivated in Liberia has been observed during recent years to be severely attacked by a sort of smut which has been identified as *Ustilaginoidea virens* [*R.A.M.*, i, p. 158; viii, p. 716], a fungus which, as far as he is aware, has not been previously recorded from West Africa.

REYDON (G. A.). **Voorloopige mededeeling over een infectiehaard van streepjeskanker bij Hevea.** [Preliminary note on a source of infection by stripe canker in *Hevea*.]—*De Bergcultures*, v, 20, pp. 536–539, 3 figs., 1931.

On an estate in Java where experiments in the control of stripe canker of *Hevea* rubber (*Phytophthora* (?) *palmivora*) [*R.A.M.*, ix, pp. 609, 803] are in progress, severe fresh infections (not more than 10 days old) were recently observed immediately above the tapping surface of the trees. The adjacent trees were either healthy or showed no trace of fresh infection. A search for the source of infection revealed the presence, within a radius of 2 m. from the cankered trees, of 5 to 7 diseased rubber seedlings half hidden by the cover crop *Centrosema pubescens*. In some cases the sporangia of *P.* (?) *palmivora* were plainly visible on the plants, the tops of which were dead, while in others these organs developed in a few days in hanging drops.

Inoculation experiments (details of which are reserved for future publication) showed that the fungus isolated from young rubber seedlings is capable of producing typical stripe canker symptoms on the bark of adult trees, from which the fungus was reisolated. It is evident, therefore, that young rubber growth attacked by *P.* (?) *palmivora* [cf. ibid., ix, pp. 267, 673] may act as a source of infection by stripe canker. On one estate some seedlings were also discovered of which the tops were healthy while the petioles or leaf bases were diseased; in some cases the plants appeared healthy but inspection of the stems showed a blackish-grey, elongated, somewhat sunken spot. From this material, too, the *Phytophthora* was consistently isolated. Infected seedlings were further de-

tected on one six-year-old plantation not yet put into tapping, showing that diseased young growth may act as a primary source of stripe canker infection.

It is thought that rain water carries the spores of the fungus into the soil and thence to the trees by means of the spattering drops and soil particles. This would explain the greater frequency of stripe canker on low than on high tapping surfaces. On many estates the ground surrounding the rubber trees is kept bare of the cover crop for a radius of about 1 m. and possibly infection may be avoided by discontinuing this practice. Plans for experimentation along these lines, combined with the application of Bordeaux mixture during the dry season, are briefly outlined.

Plan voor de meeldauwbestrijdingsproeven in 1931. [Plan for the mildew control experiments in 1931.]—*De Bergcultures*, v, 18, pp. 479–480, 1930.

Information elicited in 1930 by a questionnaire concerning the methods of dusting for the control of rubber mildew [*Oidium heveae*] in Java [*R.A.M.*, x, p. 549] has shown the urgent need for securing greater uniformity in respect of the quantities of sulphur used per hect. Estate-owners wishing to participate in experiments on this subject in 1931 are asked to communicate with the different local experiment stations.

Beeley (F.). **Test spraying experiments on young Rubber plants.**—*Quart. Journ. Rubber Res. Inst. Malaya*, ii, 4, pp. 214–225, 1931.

The results [which are tabulated and discussed] of spraying tests made with numerous preparations used to control the leaf diseases of *Hevea* rubber seedlings associated with *Helminthosporium heveae* and infestation by mites [*R.A.M.*, ix, p. 127] in Malaya showed that on 1- and 2-year old nursery seedlings rapid leaf burning followed by leaf fall was induced by one application of 2 per cent. kerosene emulsion with 0·5 or 1 per cent. lead arsenate, by lime-sulphur containing 5 per cent. polysulphide sulphur, and to a less extent by 4 per cent. kerosene emulsion, 2 per cent. lime-sulphur, and Bordeaux mixture (5–5–50). A slow burning causing gradual leaf mottling was caused by 1 and 2 per cent. liver of sulphur, 2 per cent. solbar, 2 per cent. S. 75 (a proprietary substance containing copper salts and more stable in ordinary weather than Bordeaux mixture, for which it is sometimes substituted), and by 5 per cent. ammonium polysulphide solution (which also induced leaf fall).

Ammonium polysulphide (1, 2, and 5 per cent.) was effective as a dual purpose spray, but liver of sulphur, kerosene emulsion, and lime-sulphur were less effective as fungicides than in controlling the mites. Bordeaux mixture gave complete control of mites but only partial control of disease on the young leaves. S. 75 gave promising results. Kerosene emulsion with 1 per cent. lead arsenate was effective as a dual purpose spray but is regarded as unsuitable owing to its poisonous nature and its tendency to cause leaf burning. Solbar (2 to 3 per cent.) gave good results, though

it showed a slight tendency to cause burning. Sulfinette (3 to 5 per cent.) was a good dual purpose mixture.

It is concluded that while one application of a spray is enough to indicate whether the concentration used is likely to cause burning, two or even three applications at intervals of fourteen days are required to protect the young leaves that develop after the spray has been given from *H. heveae* and mites.

NAPPER (R. P. N.). **The effects of certain fungicides on the viability of Hevea buds.**—*Quart. Journ. Rubber. Res. Inst. Malaya*, ii, 4, pp. 191–213, 1931.

When *Hevea* rubber buds all taken from a single clone, Avros 50, were disinfected by immersion in various common fungicides in Malaya, the following treatments were found to be non-injurious to the bud-wood: immersion for 2 minutes in 2 per cent. solbar or for 5 minutes if washed in water immediately after, immersion for 5 minutes in 1 per cent. lime-sulphur (B), immersion for 5 minutes in 2 per cent. sulfinette, immersion for 2 minutes in 1 per cent. liver of sulphur or for 5 minutes if washed immediately after in water, immersion for 2 minutes in 3 per cent. ammonium polysulphide or for 5 minutes if washed immediately afterwards in water, and immersion for 2 minutes in 1 per cent. uspulun universal. The results obtained with sulphur dust were indefinite, but apparently the inclusion of 1 lb. sulphur dust in the fibre required to wrap six bud sticks had no serious effects on the buds. Copper sulphate used even at only 2 per cent. concentration for 2 minutes gave unsatisfactory results.

O'BRIEN (T. E. H.). **The curing of sheet Rubber.**—*Rubber Res. Scheme (Ceylon) Bull.* 51, 34 pp., 1 graph, 1930. [Received August, 1931.]

The author states that his own observations, later confirmed by a report from the Imperial Institute, London [reproduced on pp. 30–32 of the present Bulletin], indicate that the addition, in order to prevent moulding, of paranitrophenol to rubber latex, or the soaking of the sheeted coagulum in this substance, has a detrimental effect on the ageing properties of air-dried sheet rubber. There was some evidence, however, that this effect is somewhat minimized by subsequent smoking of the rubber sheets. Smoked sheet has already been shown to be unaffected in its ageing properties by paranitrophenol [*R.A.M.*, v, p. 52; ix, p. 338].

JONES (J. P.). **The diagnostic value of plant symptoms in determining nutrient deficiencies of soils.**—*Journ. Amer. Soc. Agron.*, xxiii, 5, pp. 352–356, 1931.

Plant symptoms are of value in investigational work on particular soil deficiencies but may lead to erroneous deductions. Thus, a lack of soil magnesium gave rise to chlorosis of maize at the Massachusetts Agricultural Experiment Station, and the same deficiency is responsible for sand drown of tobacco [*R.A.M.*, ix, p. 557]. Here the same cause is responsible for two totally distinct manifestations on different crops.

In many cases lack of nitrogen causes a yellowing of the foliage

[ibid., ix, p. 415], but the same symptom may also develop in tobacco as a result of infection by black root rot [*Thielavia basicola*] even where abundant nitrogen is present. It is evident from these examples that the diagnosis of soil deficiencies by plant symptoms is only of limited value and should be supported by analytical methods.

SALMON (E. S.) & WARE (W. M.). **The Hop downy mildew and its control.**—Issued by *South-Eastern Agric. Coll., Wye, Kent*, 15 pp., 9 pl., 1931.

A popular account is given of downy mildew of the hop (*Pseudoperonospora humuli*) [*R.A.M.*, x, p. 406] with special reference to the life-history of the fungus, progress of the disease on the host, varietal susceptibility, and control by spike removal and spraying. Applications of Bordeaux mixture should never be made later than immediately after the burr has gone, as the brewers may refuse to accept sprayed cones.

DASTUR (J. F.). **Control of the foot-rot disease of Pan (Piper betle) in the Central Provinces.**—*Agric. & Live-Stock in India*, i, 1, pp. 26–31, 2 pl., 1931.

Tests [which are briefly described] made since 1926 in the Central Provinces, India, on the control of foot rot of *Piper betle* due to *Phytophthora parasitica* [*R.A.M.*, vi, p. 579] by means of soil disinfection demonstrated conclusively that if Bordeaux mixture 2–2–50 is applied to infected soil at the rate of 25 galls. per line of 150 ft. before the cuttings are planted and once every two months subsequently, then a healthy crop is assured. Some evidence was also obtained that a 1–1–50 mixture may be equally effective. In gardens where infection has already appeared this method will prevent further spread, and if it cannot be adopted, some non-susceptible crop should be substituted. The importance of thorough sanitation is emphasized, and it is pointed out that the gardens should be treated from time to time even though no new infections have been noted. Before applying the mixture the leaves should be picked to a height of about one foot above the surface of the soil, so that their market value is not destroyed by staining with the fungicide. The lower branches should also be kept free from contact with the soil to avoid infection by *Glomerella cingulata*, as well as by the foot rot fungus.

LIRO (J. I.). **Über die Mosaikkrankheit der Prunella vulgaris.** [On the mosaic disease of *Prunella vulgaris*.]—*Ann. Soc. Zool.-Bot. Fenn. Vanamo*, xi, 2, pp. 143–149, 1 fig., 1930.

In the late summer of 1924 some *Prunella vulgaris* plants at the Tikkurila Agricultural Experiment Station, near Helsingfors, Finland, showed a malformation and mosaic-like spotting of the leaves, the latter symptom closely resembling the ordinary mottling in potato mosaic.

The results [which are fully described] of experiments, in which healthy plants of *P. vulgaris* were injected through the petioles and internodes with an aqueous solution of the sap from diseased individuals, showed that the mosaic is highly infectious and often

fatal. Similar experiments conducted during the late autumn gave negative results, indicating a diminution of virulence in the virus at this season. The fact that the seeds of diseased plants yielded entirely normal individuals is thought to point to the existence, in the pedicel, ovary, ovules, or possibly in the embryo itself, of a tract through which the virus can only pass with great difficulty, if at all.

Various species of [unspecified] aphids taken from a number of hosts were found capable of transmitting the disease from diseased to healthy *P. vulgaris* plants.

HILL (A. G. G.). **Section I. Cane breeding work.**—*First Ann. Rept. Sugar-Cane Res. Stat. Dept. of Agric. Mauritius for the year 1930*, pp. 3–8, [1931].

In the course of sugar-cane breeding work in Mauritius, it was found that a 0·03 per cent. solution of sulphur dioxide had no effect upon the germination of the 'eyes' and the author suggests the possible utilization of this substance for the disinfection of setts against such diseases as gummosis [*Bacterium vascularum*] and leaf scald [*Bact. albilineans*]. Much trouble was occasionally caused by the growth in the seed boxes during dull weather of species of *Fusarium* and *Pythium*, and early in the season a red Ascomycete sometimes smothered the soil surface when baked soil was used.

Successful control of gumming.—*Australian Sugar Journ.*, xxiii, 2, p. 77, 1931.

A brief note is given on the eradication of gumming disease of sugar-cane [*Bacterium vascularum*: *R.A.M.*, x, p. 339] by the Colonial Sugar Refining Company in the Herbert River district of Queensland. In 1924 the infected area covered 3,120 acres, and 34·9 per cent. of the cropped area of 8,941 acres was declared to be diseased. Since that date the incidence of infection has steadily declined as a result of using clean seed of the approved varieties, Badila, Goru (24 A and 24 B), H.Q. 409, 1900 Seedling, Korpi, Nanemo, and Orambo, and in 1930 not a trace of gumming could be detected in the total area (9,584 acres) under cane.

Protection des plantations de Bananier dans les Colonies françaises et les Territoires sous mandat. Arrêté. [Protection of Banana plantations in French colonies and mandated territories. Decree.]—*Agron. Colon.*, xx, 158, pp. 55–56, 1931.

By a Decree dated 11th February, 1931, the previous Decree of 9th December, 1926 [*R.A.M.*, vi, p. 320], regulating the importation into the French colonies of banana plants from areas where Panama disease [*Fusarium cubense*] is known to be prevalent is amended, its provisions now applying to all French colonies except Cochin China

IMPERIAL MYCOLOGICAL INSTITUTE

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OF
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VOL. X NOVEMBER 1931

EAST (E. M.). **Immunity to Sugar Cane mosaic acquired by the host.**—*Proc. Nat. Acad. Sci.*, xvii, 6, pp. 331–334, 1931.

Working at the Harvard Botanic Gardens, Cuba, R. M. Grey found, ten or twelve years ago, that mosaic-infected sugar-cane can throw off all pathological symptoms and remain apparently healthy for a time (up to four years). Thus, in 1924 there were only 40 to 60 per cent. diseased plants in fields showing 70 to 90 per cent. in 1923. In 1930, many of the plants which had recovered previously had again contracted mosaic and were once more recovering. According to R. M. Grey, there may be as many as three successive infections and recoveries in a given plant, recovery occurring at any time between 3 and 24 months after infection.

This phenomenon admits of two interpretations. Either the infective agent may have been killed or it may merely have been reduced in virulence until the symptoms were masked and the host became a 'carrier'.

In order to ascertain whether a difference exists between the proteins of various types of infected and non-infected canes, a series of precipitin experiments with filtered extracts was carried out by the Uhlenhuth method.

No precipitin rings [cf. *R.A.M.*, x, p. 600] were formed in all possible combinations between young Cristalina non-mosaic, young Cristalina mosaic, old Cristalina non-mosaic, old Cristalina mosaic, Cristalina having mosaic the second time, Cristalina seedling non-mosaic, Cristalina seedling mosaic, and C. 64 cane (nearly immune from mosaic). No precipitin reactions, moreover, were obtained when the immune *Saccharum biflorum* and *S. ciliare* (which constantly reacted plus 1 against each other) were tested against badly infected Cristalina stock and apparently non-infected Cristalina (possibly a carrier). Consistent plus 1 reactions, however, were obtained against a Cristalina seedling known never to have had mosaic, which also gave a similar reaction when tested against the badly infected and apparently healthy Cristalina stocks.

In a third experiment mosaic Cristalina, non-mosaic Cristalina, and a seedling H 21087 (altogether free from mosaic) were tested against extracts of various plants not belonging to the Gramineae. With most of these there was no reaction; with *Lucuma nervosa*,

however, the reaction was plus 1 in each case, while with *Eriobotrya japonica* and *Cassia spectabilis* it was consistently plus 1 with the mosaic-free seedling and consistently plus 2 with the mosaic and non-mosaic Cristalina stocks.

The results of these tests, while far from conclusive, give some indication of a consistent precipitin reaction difference between Cristalina type canes known to be free from mosaic and those which have or may have had the disease. This evidence seems to lend support to the second of the above-mentioned hypotheses, viz., that apparent immunity is acquired by a reduction of the virulence of the mosaic virus.

A new bacterial disease of Sugar Cane and suggestions for its prevention.—*Sugar News*, xii, 5, p. 300, 1931.

This is a brief note on the occurrence of the bacterial disease of sugar-cane caused by *Bacillus sacchari* in the Philippines [cf. *R.A.M.*, x, p. 490]. As soon as the disease is detected, the entire stool in which the infection is found should be dug out and thrown into a pit or burnt. In case of an epidemic this measure should be followed by ploughing in order to expose the uncollected stubble to sunlight, which kills the causal organism in a few hours.

SUBRAMANIAM (L. S.). **A note on the downy mildew of Sugar-Cane in India.**—*Agric. & Live-Stock in India*, i, 1, pp. 32–33, 2 pl. (1 col.), 1931.

During the summer of 1930, the downy mildew of sugar-cane, caused by a species of *Sclerospora*, was reported for the first time in India, being observed at Pusa on one plant only of Co. 316. Besides the white downy growth of the fungus, the leaves showed a mosaic-like mottling which later became more crowded and yellowish than in true mosaic. The yellow spots did not form the long, chlorotic bands characteristic of the Indian and Philippine species of *Sclerospora* on maize [*R.A.M.*, i, pp. 40, 169; ii, p. 360].

The hyphae measured up to 8 μ in diameter, and were commonest in the mesophyll tissues; they bore button- and finger-shaped haustoria. The 1- to 3-septate conidiophores arose from the stomata singly or in clusters of two to four; they measured 132 to 264 by 16·5 to 27·5 μ, averaging 186 by 22 μ, were bulbous at the base, then narrower, but broader again in the middle, branched two to four times at the tip and ended in two or three broad, conical, sterigmata, 4·4 to 27·5 μ long. Very often a foot-like projection at the base of the conidiophores showed the point of attachment to the mycelium. The elliptical or oblong, papillate, granular, thin-walled conidia measured 18·7 to 45·1 by 13·2 to 26·4 μ, the average measurements of 200 being 31·5 by 18·8 μ. Though the measurements of the conidiophores and conidia bring the fungus within the limits of *S. sacchari* the Indian species differs from the published descriptions of *S. sacchari* in that there is no splitting of the leaves and no elongation of the diseased stalk.

Inoculations on a number of plants resulted so far in the infection of maize only.

FAWCETT (G. L.). **La putrefacción negra de la Caña de Azucar.** [Black rot of Sugar-Cane.]—*Rev. Indust. y Agric. Tucumán*, xxi, 3–4, pp. 55–59, 1931.

Attention is again drawn to the occurrence in the province of Jujuy, Argentine Republic, of black rot of sugar-cane (*Thielaviopsis ethaceticus*) [*Ceratostomella paradoxa*: *R.A.M.*, viii, p. 636]. The cane borer *Diatraea dyari* is believed to play a part in the dissemination of the disease. At the present time the fungus does not appear to occur in Tucumán, and its entry into the province may be prevented by strict adherence to the quarantine regulations prohibiting the importation of cane from other parts of the Republic or from abroad.

PEEREBOOM (N. J.). **Kalimati-ziekteverschijnselen in Banjoemas en Bagelen.** [Kalimati disease phenomena in Banjoemas and Bagelan.]—*Arch. voor Suikerind. Nederl.-Indië*, Deel i, xxxix, 19, pp. 491–497, 1931.

Notes are given on the occurrence of the 'kalimati' disease of sugar-cane [*R.A.M.*, x, p. 491] on laterite soils at Klampok, Banjoemas, and on greyish-brown clay and laterite at Poerworedjo, Bagelen, Java. Both types of soil are characterized by a very low phosphate and potash content and by a high degree of hydrolytic acidity, especially of the upper soil layers.

The symptoms of the disease were found to agree in the main with the description given by Miss Wilbrink (*Versl. Adviseurs Vereen.*, p. 325, 1929). The P.O.J. 2878, 2833, and 2961 varieties were affected; in P.O.J. 2883 the broom-shaped roots were permeated with *Rhizoctonia*, presumably in a secondary capacity. The disease was first observed in August, when the canes were about three months old, and during September the symptoms were conspicuous on both soil types in Bagelen. Before the onset of the rains the symptoms began to disappear, and some months later there was no further trace of the kalimati disease. On the greyish-brown clay soils one of the distinguishing features of the disease was absent or inconspicuous, namely, the longitudinal brown stripes on the leaves resembling Morse code signs. In the writer's opinion the peculiar yellow discoloration of the older leaves is a more reliable indication of kalimati disease than the Morse code signs, which are associated with a later stage of the disturbance and may possibly be due to other causes. The so-called 'Negros yellows' occurring in the Philippines would appear to be closely related to the kalimati disease. Copious accumulations of iron were found in the buds of young cane growing in plantations where kalimati disease was present. The results of preliminary experiments indicate that the hydrolytic acidity of the soil may be reduced by the application of a complete fertilizer.

SĂVULESCU (T.) & SANDU-VILLE (C.). **Contribution à la connaissance des Micromycètes de Roumanie.** [Contribution to the knowledge of the Micromycetes of Rumania.]—*Bull. Soc. Myc. de France*, xlvi, 3–4, pp. 177–192, 1931.

This is an enumeration (with hosts and localities) of 142 species of microfungi (excluding the Ustilagineae, Uredineae, Erysiphaceae,

and Peronosporaceae) which have already appeared or will appear in the Rumanian Mycological Herbarium ('Herbarium Mycologicum Romanicum') published by the Phytopathological Station in Bucharest. Of interest is the statement that *Synchytrium endobioticum* has been recorded on potato in the district of Fagaras, and that *Phyllosticta tabaci*, *Ascochyta nicotianae*, and *Cercospora nicotianae* occur on tobacco leaves throughout Rumania.

MAIRE (R.). **Études mycologiques (Fascicule 4).** [Mycological studies (Part 4).]—*Bull. Soc. Myc. de France*, xlvi, 3–4, pp. 215–244, 10 figs., 1931.

In this continuation of his mycological studies, the author gives notes on 26 species of fungi, many of which are described (with Latin diagnoses) as being new to science. In a separate note he states that he found in Portaria, near Volo, Greece, a species of the Erysiphaceae producing numerous perithecia on the leaves of *Cucurbita pepo*, which was indubitably referable to the type species *Sphaerotheca humuli* and not to its var. *fuliginea* [cf. *R.A.M.*, v, p. 71; vii, p. 273]. Cucurbits are thus parasitized by at least two species of Erysiphaceae, namely, *S. humuli* and *Erysiphe cichoracearum*.

STELLING-DEKKER (Frau N. M.). **Die Hefesammlung des 'Centraalbureau voor Schimmelcultures': Beiträge zu einer Monographie der Hefearten. I. Teil. Die sporogenen Hefen.** [The yeast collection of the 'Centraalbureau voor Schimmelcultures': contributions to a monograph of the yeasts. Part I. The sporogenous yeasts.]—*Verh. K. Akad. Wetensch. Amsterdam Afd. Natuurkunde* (Sect. 2), xxviii, 1, vii + 547 pp., 353 figs., 1931.

This is a comprehensive survey of the author's work on the yeast collection of the 'Centraalbureau voor Schimmelcultures', Delft, Holland, which comprised a critical examination of the species represented and an attempt at the reclassification of the sporogenous yeasts on a rational basis. The morphological and physiological characters of each species are fully described. In the proposed new system (shown by means of a table) the genus *Nematospora* Peglion [*R.A.M.*, v, p. 390] (represented by *N. coryli* [ibid., x, p. 519], *N. phaseoli*, *N. nagpuri* [ibid., x, p. 101] and *Ashbya gossypii*) is placed in the sub-family Nematosporoideae of the family Endomycetaceae. The genus *Ashbya* [ibid., viii, p. 201] is regarded by the author as no more than a section of *Nematospora*.

DANA (B. F.) & WOLFF (S. E.). **The occurrence of violet root rot in central Texas.**—*Phytopath.*, xxi, 5, pp. 557–558, 1 fig., 1931.

During 1929 violet root rot (*Rhizoctonia crocorum*) was found to be prevalent in the highly calcareous clay to clay loam soils of the wooded areas along the Little and Leon rivers, Bell County, Texas, and subsequently the perfect stage of the fungus, *Helicobasidium purpureum* [*R.A.M.*, x, p. 434], was also found in the same region. Among the infected hosts [which are listed] were *Melia azedarach*, *Morus* sp., *Parthenocissus quinquefolia*, *Phyto-*

lacca decandra, *Rhus radicans*, *Salix nigra*, *Sambucus canadensis*, and *Solanum elaeagnifolium*. In very moist areas the fungus was prevalent on roots in the first 4 to 6 inches of soil, while in dry soil abundant mycelium was found at a depth of 16 to 20 inches. Hence it would appear that ample moisture is favourable to the growth of *R. crocorum*.

SING (U. B.). **Studies in the genus Cercospora.**—*Journ. Indian Bot. Soc.*, x, 2, pp. 73–91, 2 pl., 3 figs., 8 graphs, 1931.

Cultural studies were made of the following species of *Cercospora* collected near Allahabad, India: *C. patouillardi* on *Calotropis procera*, *C. feuilleauboisii* on *Solanum nigrum*, *C. leucosticta* on *Melia azedarach*, and *C.* sp. on *Cajanus indicus*. The size of the conidia was found to vary somewhat on different media and also according to the humidity. The number of septa also varied considerably with the medium, and there was a strongly marked negative correlation between staling and septation.

A sterile saltant of *C. leucosticta* was observed. It grew more rapidly than the parent, and was characterized by a loose white aerial and chocolate-coloured submerged mycelium and a non-staling colony, while in the parent form the aerial mycelium was smoky brown and the submerged greyish-black, the colony being of the staling type.

The unnamed species on pigeon pea was characterized by obclavate, tapering, hyaline to pale yellow conidia, 31·2 to 124 by 3 to 4 μ, and caused the development of irregular, raised spots mostly on the under surface of the leaf, but sometimes also on the petioles and stem.

STEVENS (F. L.). **A comparative study of Sclerotium rolfsii and Sclerotium delphinii.**—*Mycologia*, xxiii, 3, pp. 204–222, 14 figs., 1 graph, 1931.

This is a detailed report of the author's comparative study in pure culture of four strains of *Sclerotium delphinii* [*R.A.M.*, x, p. 48] and a strain of *S. rolfsii* [ibid., x, p. 165] which is of the same character as that on which the type of the species was established, and a description of which, as it usually appears on rice or carrots, is given to serve as an amplification of the type description. The chief morphological differences noted between the two species are that while in *S. rolfsii* the aerial mycelium is usually densely floccose and assumes the ropy form only under conditions unfavourable for growth, in *S. delphinii* it is always ropy and never becomes floccose. The sclerotia of *S. rolfsii* are typically small, sessile in the mycelium, nearly or quite globose, very uniform in size, smooth and without surface markings, and pinkish-buff to clove-brown (Ridgway); those of *S. delphinii* are larger and vary more in size (maximum 5·18 mm.; mode at 2·18 mm.), stalked from being formed at the tip of a mycelial fascicle, sub-globose, arched on the dorsal side but hollowed below, so that when inverted they are saucer-shaped, bearing in the centre a hilum-like scar, surface marked (pitted), and ochraceous-buff to Hay's brown. It is pointed out, however, that under certain conditions nearly all of the differentiating characters may

disappear, with the exception of sclerotial colour which is a constant feature. These differences are considered to be such as to warrant the retention of these organisms as different species, although the whole study pointed to a very close relationship between them.

FUKUSHI (T.). **On the modes of transmission of the mosaic disease of Tobacco.**—*Journ. Sapporo Soc. Agric. & Forestry*, xxii, 102, pp. 305–320, 1931. [Japanese, with English summary.]

Three modes of transmission of tobacco mosaic are recognized as of practical importance, viz., handling of healthy plants after diseased ones in transplanting, topping, weeding, and similar operations; spread through the soil; and dissemination by insect vectors. None of these agencies, however, explains the origin of initial infection in the seed-bed and in fields where tobacco is planted for the first time. Pipe or cut tobacco was suspected as a source of the virus, and infection was actually obtained from 25 out of 30 packages of four commercial brands of tobacco. Infection was produced on young tobacco plants by rubbing and slightly crushing the leaves between the fingers after rubbing these with a small amount of pipe tobacco. It is highly probable, therefore, that the mosaic disease may be spread by tobacco growers, who are habitual pipe smokers, in cultural operations [cf. *R.A.M.*, ix, p. 21].

Young tomato plants similarly inoculated with cut tobacco remained free from mosaic.

SMITH (K. M.). **Thrips tabaci Lind. as a vector of plant virus disease.**—*Nature*, cxxvii, 3214, pp. 852–853, 3 figs., 1931.

Further studies have been carried out on the insect vectors of the ring spot of *Solanum capsicastrum* first detected in a Cardiff glasshouse two years ago [*R.A.M.*, x, p. 614], and of these *Thrips tabaci* has been found the most efficient. This is stated to be the first record of plant virus transmission by *Thrips* in the British Isles.

Recently the writer received, also from Cardiff, some tomato plants which were found to be infected with the very serious virus disease known in Australia as spotted wilt [ibid., x, p. 65]. Diseased plants are characterized by a bronzing of the young leaves, ring-like markings on the foliage and fruit, and cessation of growth; they may even be killed. Experiments at Cambridge have shown that this disease, which in Australia is transmitted by *Frankliniella insularis*, is also transmissible by *T. tabaci*.

A comparative study of the host range and symptom expression on differential hosts of the viruses of these two diseases affords almost conclusive evidence that both diseases are due to the same entity. It would also appear that dahlias act as hosts of this virus. Dahlias affected by a virus disease characterized by concentric circles on the leaves commonly occur near tomatoes infected by spotted wilt. Inoculation from diseased dahlias to tobacco and *Datura* [*stramonium*] produces symptoms indistinguishable from those caused in these hosts by spotted wilt and the *S. capsicastrum* ring spot.

In the light of these new data it seems possible that the insect vector of tobacco ring spot in the United States may also be *T. tabaci*; whether there is any connexion between this disease and tomato spotted wilt, recently detected in that country [ibid., x, p. 414], remains to be proved.

T. tabaci is stated to be of common occurrence in English glass-houses, where it is, however, frequently overlooked on account of its minute size. Its presence may be recognized by its feeding marks, consisting of silvery-white patches on the leaves, accompanied by minute granules of excreta. Spotted wilt being of considerable economic importance in Australia, growers are warned to keep watch for its occurrence in English tomato crops.

WESTERDIJK (JOHANNA), LEDEBOER (MARIE), & WENT (JOHANNA). **Mededeelingen omtrent gevoeligheidsproeven van Iepen voor Graphium ulmi Schwarz, gedurende 1929 en 1930.** [Notes on the testing of Elms for susceptibility to *Graphium ulmi* Schwarz during 1929 and 1930.]—*Tijdschr. over Plantenziekten*, xxxvii, 5, pp. 105–110, 1931.

Details are given of a series of tests conducted at Baarn, Breda, and Vleuten, Holland, during 1929–30, on the reaction of different species and varieties of elms to infection by *Graphium ulmi* [*R.A.M.*, x, p. 632]. Experiments were further made on a number of seedlings of *Ulmus* '*campestris*' (= *U. foliacea* Gilbert and its hybrids for the most part), *U. montana*, *U. americana*, and *U. alata* from France, Spain, Bulgaria, Holland, and the United States. The inoculations were made on twigs with spore suspensions of the fungus.

Ulmus pumila, *U. pumila* [var.] *pinnato-ramosa*, *U. japonica*, *U. wilsoniana*, *U. racemosa*, and *U. procera* [var.] *gracilis*, remained immune from infection. Some degree of resistance was shown by *U. parvifolia* and *U. glabra* [var.] *fastigiata*. Among the susceptible varieties were *U. americana*, *U. americana* var. *pendula*, *U. serotina*, *U. alata*, *U. laevis*, and several types of *U. foliacea*, *U. glabra*, and *U. hollandica*. The French seedlings of *U.* '*campestris*' (from Orleans) yielded the largest number of resistant individuals; there was a very high incidence of infection among the two-year-old Spanish seedlings, while the Dutch and Bulgarian seedlings, German (*U. montana*), and American (*U. americana* and *U. alata*) also proved susceptible. Out of a total of 2,818 seedlings inoculated in 1930, 860 remained free from the disease and the rest became infected.

A study of the relative value of different methods of inoculation with *G. ulmi* showed that the infection of pruning wounds results only in a short discoloration of the vessels and does not cause wilting of the branches; this mode of infection does not appear to occur in nature. Negative results were given by the spraying of unwounded branches with spore suspensions, while wilting and discoloration followed the injection of a spore suspension into needle-pricked branches. In order to ensure the efficacy of inoculation the operation should be performed during the hot weather of June and July; after about 20th August the results are apt to

be doubtful. Only in a small number of cases was infection found to persist the year after inoculation.

A species of *Pythium*, possibly *P. intermedium* [ibid., ix, p. 5], was isolated from an elm with black streaks in the youngest wood vessels.

Armillaria mellea was responsible for the death of a row of 25-year-old elm trees at Baarn; the crowns were completely wilted and the root system was found to be decayed. This is believed to be the first case of its kind on record.

Verticillium dahliae [loc. cit.] was isolated from some elms showing a brown discoloration of the wood at Utrecht.

BUISMAN (CHRISTINE). **Overzicht van de soorten van Iepen, in verband met het Iepenziekteonderzoek.** [Survey of Elm varieties in connexion with the Elm disease investigation.]—*Tijdschr. over Plantenziekten*, xxxvii, 5, pp. 111–116, 3 pl., 1931.

In connexion with the recent experiments in Holland on the varietal susceptibility of elms to *Graphium ulmi* [see preceding abstract], the writer gives notes on the distribution of the different species and varieties of *Ulmus* in America, Asia, and Europe.

RUSBY (H. H.). **Will our Chestnut tree return?**—*Journ. New York Bot. Gard.*, xxxii, 373, pp. 11–12, 1 pl., 1931.

Attention is drawn to the production, in the mountains of Morris County, New Jersey, of ripe chestnuts on seedlings and shoots developing from the stumps of trees killed by blight [*Endothia parasitica*: *R.A.M.*, x, p. 496]. It is stated that the supply of native chestnuts in the New York market was much larger during 1930 than at any time within the last decade.

VOGLINO (P.). **Il nerume delle Castagne.** [Black mould of Chestnuts.]—*La Difesa delle Piante*, viii, 2, pp. 1–4, 1931.

Every September or October from 1927 to 1930, inclusive, the author has found the conidial stage of *Sclerotinia pseudotuberosa* [*R.A.M.*, vii, p. 557; viii, p. 614] on chestnuts of the previous year picked up from chestnut heaps in the groves near Susa [Piedmont]; the conidia of the fungus (*Rhacodiella castaneae*) [ibid., iii, p. 5] were found to have retained their germinative capacity. Infection appears to occur usually on the fallen chestnuts on the ground, and the invaded nuts do not show any external symptoms at first. Internally the fungus develops on or between the cotyledons, causing small black spots which enlarge and become carbonaceous from the growth of the hyphal masses. These appear on the surface as a fuliginous, felt-like covering 3 to 10 mm. thick which becomes stromatic and forms spherical sclerotia on its surface. Sclerotia are found also within the fruit.

BERTOTTI (F.). **Ricerche sulle muffe delle Castagne.** [Studies on the moulds of Chestnuts.]—*Ann. R. Accad. Agric. Torino*, lxxii, pp. 47–58, 1930. [Received June, 1931.]

This is an expanded account of the author's researches on the occurrence of moulds (chiefly *Penicillium crustaceum*, *Tricho-*

thecium roseum, and *Mucor* sp.) on stored chestnuts in Italy, and on the possibilities of controlling the defect [*R.A.M.*, ix, p. 6].

Proceedings of the Conference on the Spike-Disease of Sandal held at 11 a.m. on Monday, the 7th July, 1930, at the Indian Institute of Science, Bangalore.—*Indian Forester*, lvii, 5, pp. 215–233, 1931.

In connexion with studies in progress on the spike disease of sandal [*Santalum album*: *R.A.M.*, x, p. 495] in Madras, accounts are given of the survey of the insect fauna of sandal, of field work on the spread of the disease in spiked areas, and of some aspects of the ecology of sandal with particular reference to the occurrence of the disease.

J. E. M. Mitchell stated that the incidence of spike is always highest in areas containing *Lantana*, which not only tends to deplete the soil of moisture and nutrients but also harbours insects, some of which probably act as vectors of spike. By removing the *Lantana* and spiked sandal, and by keeping a 100 ft. belt clear of the former round the experimental plots, it was possible to reduce the spread of the disease to a minimum in 1929. On the other hand, the removal of spiked trees alone failed to affect the spread of infection. The highest incidence of spike has always been observed between May and July. The disease is favoured by an annual rainfall between 15 and 20 inches.

Experimental work by M. Sreenivasaya is stated to furnish strong indirect evidence in favour of the presence of an insect vector. Under silvicultural conditions the disease is spread either by infection of the top through some agent, probably an insect, or by root transmission, as established by controlled experiments.

Herbert (D. A.). **Cyttaria septentrionalis, a new fungus attacking Nothofagus moorei in Queensland and New South Wales.**—*Proc. Roy. Soc. Queensland*, xli, 13, pp. 158–161, 1 pl., 1930. [Received 1931.]

The author states that a search in 1929 revealed the presence on one of the Australian beeches, *Nothofagus moorei*, on both sides of Mount Hobwee, on the border of Queensland and New South Wales, of a species of *Cyttaria*, immediately distinguishable from the other Australian species of this genus (*C. gunnii*) by the size of its fruit bodies; it is considered to be new to science, and is named *C. septentrionalis* on account of its being the northernmost member of this genus so far found. A brief Latin diagnosis is appended.

As regards the effect of the fungus on the host, it is stated that the branches beyond the galls formed by it are retarded in their growth; occasionally the gall is at the end of a branch, the distal parts of which have been killed. In certain cases, however, although a number of clusters of the fruiting stromata occur along the length of the branch, the general appearance of the host is normal. The disease is considered to be a serious one. There was evidence that the fungus also occurs on Mount Wanungra, which is a few miles to the west of Mount Hobwee.

LIESE [J.]. **Starke Schäden durch den Pappelkrebs.** [Heavy damage from the Poplar canker.]—*Deutsche Forstzeit.*, xlvi, 19, pp. 465–466, 2 figs., 1931.

Poplar (*Populus ? canadensis*) branches submitted for examination from Ahaus (near the Dutch frontier) showed extensive damage from cankers due to *Nectria galligena* var. *major* [*R.A.M.*, vii, p. 677]. In western Westphalia a devastating poplar epidemic is attributed by Prof. Jahn, of the Hann.-Münden Botanical Institute, to *N. coccinea* var. *sanguinella*, but whether this fungus or *N. galligena* var. *major* is involved requires further study [cf. also ibid., x, p. 567]. Since the poplar is believed to have a great future in German silviculture, no effort should be spared to arrest the spread of these serious disturbances.

ROHMEDER (E.). **Anbaufläche und Gefährdungen der Strobe im bayerischen Staatswald.** [Area under White Pine in the Bavarian State forest and risks to which it is exposed.]—*Forstwissensch. Centralbl.*, liii, 9, pp. 325–339, 2 maps, 1931.

The following information on the relative incidence of blister rust [*Cronartium ribicola*] and the honey fungus [*Armillaria mellea*] on white pines [*Pinus strobus*] in the State-owned forests of Bavaria is based on the replies to a *questionnaire* circulated in 1926 [*R.A.M.*, x, p. 351].

The rapid extension of blister rust (from 43 hect. affected in 1899 to 1,677 in 1926) is certainly alarming, but in many districts the ravages of *A. mellea* are far more serious. Whereas 13 per cent. of the total area under white pine is free from blister rust, *A. mellea* is absent from only 7 per cent. The latter is further responsible for gaps in the stand and the death of groups of trees in over 58 per cent. of the total area, compared with only 32 per cent. for *C. ribicola*. At present, therefore, *A. mellea* is undoubtedly the more injurious of the two fungi, though south of the Danube blister rust is rather more injurious than the honey fungus. Good results have been obtained in several Swabian forest areas in controlling blister rust by its natural enemy, *Tuberculina maxima* [ibid., ix, p. 691], while there is practically no method of controlling *A. mellea*. The incidence of the latter organism increases with the admixture of deciduous trees, especially beeches, on the roots of which it flourishes as a semi-saprophyte. The distribution of the two fungi is shown in the maps.

OFFORD (H. R.). **The chemical eradication of Ribes.**—*U.S. Dept. of Agric. Tech. Bull.* 240, 24 pp., 7 figs., 1931.

A number of chemicals have been tested for several years under varying field conditions in Idaho and Montana to determine their relative efficacy in the destruction of *Ribes petiolare*, *R. lacustre*, and *R. inerme*, alternate hosts of the white pine blister rust fungus (*Cronartium ribicola*) [*R.A.M.*, x, p. 353].

The results of the experiments [which are tabulated and discussed] showed that the two most effective substances for this purpose are 25 per cent. sodium chlorate and 4 per cent. sodium hydroxide plus 5 per cent. sodium fluoride, both applied at the rate of 1 qt. per plant. The first-named proved most useful in

stream-bottom lands, where the root systems of individual plants are often under water and hence difficult to locate. *R. petiolare* is the most readily killed of the three species of *Ribes*, both the others showing considerable resistance and often re-establishing themselves by sprouting from the crown. In such cases three applications of 25 per cent. sodium chlorate were necessary to kill 98 to 100 per cent. of the treated plants. When used as a spray (10 per cent. strength) fish-oil soap or flake glue, 0·01 to 0·05 per cent. by weight of the dry chemical, were found to be satisfactory stickers and spreaders for the sodium chlorate. The treatment should be given early in the growing season during dull, cloudy weather. The young growth is usually dead at the end of a week and older stems after 12 to 14 days.

The results of large-scale trials showed that power spraying effected a saving of 56 per cent. over eradication by hand in areas where *Ribes* occurred in profusion, and 49 per cent. where the bushes were less abundant.

Sodium chlorate is highly inflammable and its use necessitates special precautions [which are indicated] on the part of workmen engaged in its application. When used as a spray for the aerial parts of the plants a strength of 10 per cent. is sufficient.

LIESE [J.]. **Auffallende Cenangium-Erkrankung der Kiefernkeimpflanzen in Pommern und der Grenzmark.** [Remarkable *Cenangium* epidemic of Pine seedlings in Pomerania and the Grenzmark.]—*Deutsche Forstzeit.*, xlvi, 21, pp. 535–536, 1931.

A severe epidemic of die-back of one- to three-year-old pine seedlings, caused by *Cenangium abietis*, developed in Pomerania and the Grenzmark during the spring of 1931 [*R.A.M.*, i, p. 332; x, p. 272]. Since leaf fall [*Lophodermium pinastri*: ibid., x, p. 634] has also been very prevalent during the current season, *C. abietis* may not immediately be recognized as the cause of distinct symptoms. A sure sign of the presence of the latter fungus is the non-emergence of the buds in May on the affected leading and accessory shoots.

SCHOENWALD (R.). **Wahrnehmungen über das Triebschwinden der Kiefer (Cenangium abietis [Pers.]) in den Jahren 1926–28.** [Observations on the die-back of Pine shoots (*Cenangium abietis* [Pers.]) during the years 1926–28.]—*Deutsche Forstzeit.*, xlvi, 19, pp. 484–485, 1931.

Notes are given on an epidemic of die-back of pine shoots due to *Cenangium abietis* which affected trees of all ages (chiefly 20 to 30 years) in East Prussia from 1926 to 1928 [see preceding abstract]. The delicate cortex of the annual incremental shoots was ruptured in places, so that the sap exuded, and the underlying cambium showed brownish spots and longitudinal stripes, accompanied by the brownish-black, coriaceous pustules of the fungus, up to 3 mm. in diameter. The examination of the roots of diseased trees in various localities revealed the presence of *Agaricus melleus* [*Armillaria mellea*] and *Polyporus* [*Fomes*] *annosus* [*R.A.M.*, x, p. 354] in a virulent form, and infection by *C. abietis* is believed to have been secondary to the attacks of these parasites.

LUTZ (L.). **Sur les ferments hydrolysants sécrétés par les champignons Hyménomycètes. Dégradation des éléments constituants de la membrane cellulaire.** [On the hydrolysing ferments secreted by the Hymenomycetes. Degradation of the elements composing the cellular membrane.]—*Bull. Soc. Chim. Biol.*, xiii, 4, pp. 436–457, 4 figs., 1931.

Continuing his investigations on the action of the lignicolous Hymenomycetes on their hosts [*R.A.M.*, ix, p. 618], the author made a detailed study, *inter alia*, of *Coriolus* [*Polystictus*] *versicolor* on beech and *Gleditschia triacanthos* and of *Polyporus* [*Fomes*] *pinicola* [ibid., x, p. 571] on maritime pine [*Pinus maritima*].

The destruction of the ligneous substance was found to proceed by stages, the various constituents of the lignified membrane being transformed in turn into insoluble gums, soluble pseudo-gums, and finally into sugars. In the case of beech, the sugars consist chiefly of xylose, whence it would appear that the gum formed at an earlier stage is produced chiefly by xylane. The chemical properties of the soluble pseudo-gum are intermediate between those of the true gums and those of the sugars forming the true sources of carbon for the fungus. Towards some of these sugars the organism appears to act as an alcoholic ferment.

The lignin is the first element to undergo dissolution; until it is actually converted into gum the cellulose and the middle lamella of the cells remain almost or completely intact. Only after the total disappearance of the cellulose does the middle lamella, the last trace of the original cell structure, also undergo lysis.

Some minor points of difference were observed in connexion with the decay of *P. maritima*, but they are not considered to affect the main conclusions derived from these investigations.

BRYAN (J.). **The open tank process for antiseptic treatment of timber for estates, farms, collieries, etc.**—Pamphlet issued by *Forest Products Res. Lab.*, Princes Risborough, Bucks., 6 pp., 4 pl., 1 graph, [? 1931].

In this pamphlet a brief description is given of the installation and running of an 'open tank process' plant for the impregnation of agricultural and industrial timber with creosote, and recommendations are made for the adequate preparation of the timber for treatment. A brief reference is also made to the process commonly known as 'butt treatment', which is sufficient for the preservation of fence posts and the like.

FUKUSHI (T.). **On the mosaic disease of Broad Beans.**—*Journ. Plant Protect.*, xvii, 11, pp. 707–712; 12, pp. 779–784, 1 pl., 1930. [Japanese. Received July, 1931.]

An account is given of the host range, symptoms, etiology, and modes of transmission of mosaic of broad beans [*Vicia faba*: *R.A.M.*, vii, p. 134], which is stated to be moderately prevalent in the Prefecture of Tottori, Japan.

JENKINS (ANNA E.). **Additional data on the range and prevalence of Lima-Bean scab.**—*Phytopath.*, xxi, 5, p. 559, 1931.

The examination of consignments of Lima beans [*Phaseolus lunatus*] from the department of Sinaloa, Mexico, revealed the presence of scab (provisionally attributed to *Elsinoe canavaliae*) [*R.A.M.*, x, p. 578], which was hitherto only known on this host from Cuba and Porto Rico.

RAMBOUSEK (F.). **Schädlinge und Krankheiten der Zuckerrübe im Jahre 1930.** [Pests and diseases of the Sugar Beet in the year 1930.]—*Zeitschr. für Zuckerind.*, Prague, lv, 42, pp, 539–551, 8 figs., 1931.

The complex manifestations known collectively as 'beet root blight' [*R.A.M.*, x, p. 425] were less prevalent in Czecho-Slovakia during 1930 than in the previous year, and in no case did the loss from this cause exceed 4 per cent. Heart rot is generally considered to be a sequel to root rot, but it frequently occurs independently of the latter. *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., ix, p. 220] appeared early in the season, especially on beets following clover. Leaf spot and rust (*Cercospora beticola* and *Uromyces betae*, respectively), were prevalent, the latter persisting until the beginning of November.

RIEMAN (G. H.). **Genetic factors for pigmentation in the Onion and their relation to disease resistance.**—*Journ. Agric. Res.*, xlii, 5, pp. 251–278, 3 pl. (2 col.), 1931.

A detailed account is given of investigations conducted by the author in an attempt to make a genetic analysis of the relation between the pigmentation of red, yellow, and white onions and resistance to smudge (*Colletotrichum circinans*) [*R.A.M.*, ix, p. 284]. In the course of the work a classification was made of some 330 progenies and 22,000 bulbs.

In order to interpret the results obtained in the F_1 to F_4 generations the author found it necessary to postulate the existence of five different genes governing bulb pigmentation, viz., (1) I gene for incomplete inhibition of colour, (2) i gene allowing expression of colour, (3) W gene for red pigment, (4) W^y gene for yellow pigment, and (5) w gene for white. Gene I is dominant to its allelomorph i. The heterozygous factor pair Ii in the presence of the colour genes W or W^y produces red neck and cream coloured bulbs. Independent inheritance is demonstrated between the allelomorphic pair Ii and the genes for colour.

The gene for red, W, is dominant to the gene for yellow, W^y, and to the gene for white, w. It is assumed that the gene W is allelomorphic to the genes W^y and w. The relation between genes W^y and w was not demonstrated.

The genes W and W^y are each responsible for the production of protocatechuic acid, extremely toxic to *C. circinans*, in the outer scales of resistant onions.

The colour-inhibitor gene, I, interacts with the W gene for red, producing bulbs which show an intermediate degree of resistance to smudge.

MILLER (P. A.) & BARRETT (J. T.). **Cantaloupe powdery mildew in the Imperial Valley.**—*California Agric. Exper. Stat. Bull.* 507, 36 pp., 13 figs., 1931.

Notes are given in semi-popular terms on the etiology and control of powdery mildew of cantaloupes (*Erysiphe cichoracearum*) in the Imperial Valley, California [*R.A.M.*, viii, p. 550]. The fields may be kept practically free from mildew by fortnightly applications of finely ground or sublimed sulphur at the rate of 10 to 15 lb. per acre, beginning before the disease appears. Bordeaux mixture has been found to give only partial control of mildew, and dry copper dusts are useless. Cucurbit species vary in their susceptibility to sulphur injury and applications to cantaloupes of very small quantities of sulphur in dust or spray form have caused such severe injury to the plants that these substances cannot be recommended for use on a commercial scale. Individual plants of cantaloupe and other commercial melon varieties have displayed a marked resistance to sulphur burn and selections of these are being grown for further testing. Various other preparations tested proved either injurious or ineffective. The application of sulphur to the surface of the soil did not give satisfactory control of the disease.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude d'un Fusarium nouveau: Fusarium citrulli.** [Study of a new *Fusarium*: *Fusarium citrulli.*]—*Comptes rendus Soc. de Biol.*, cvii, 14, pp. 55–57, 1931.

Notes are given on the morphological and cultural characters of *Fusarium citrulli* n. sp., isolated from watermelon in Alsace-Lorraine in association with a bacterium [*R.A.M.*, viii, p. 697]. The falcate, spatulate, or fusiform conidia, 30 to 60 by 5 μ, sometimes non-septate, in other cases uni- or bi-septate, are borne singly or in groups of two to three at the sides or apices of sparsely septate, white hyphae; chlamydospores measuring 10 to 15 by 13 to 25 μ were also observed. The optimum growth of the fungus on carrot occurs at 22° to 25° C.

SCHELLENBERG (H.). **Neuzeitliche Technik in der Bekämpfung des falschen Meltaues.** [Modern technique in the control of downy mildew.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xl, 10, pp. 209–217, 1931.

Some of the principal requirements for the successful control of downy mildew of the vine (*Peronospora*) [*Plasmopara viticola*] in Switzerland are enumerated and discussed. It is very important to clear the stocks of suckers, and also to remove enough of the inner foliage for sun and wind to penetrate [*R.A.M.*, x, pp. 579, 580]. Bordeaux mixture remains the best of all the preparations tested against downy mildew. It should be used at a strength of 1·5 per cent. for the first application and at 2 per cent. for subsequent ones. Six applications should be given between the middle or end of May and the end of July or beginning of August. Improved automatic and battery sprays [details of the construction of which are given] are now obtainable from the firms of Birch-

meier (Künten) and Wettstein (Oerlikon). The cost of the treatment in one locality in 1930 was Fr. 81 (77·76 working hours) per hect.

DUBOIS (P.). **Le traitement du mildiou de la Vigne par les bouillies cupriques.** [The treatment of Vine mildew by copper mixtures.]—*La Vie Agric. et Rurale*, xx, 21, pp. 325–326, 1931.

Directions are given in popular terms for the control of downy mildew of the vine [*Plasmopara viticola*] in France by five applications of a copper-containing fungicide, (1) when the shoots are 8 to 10 cm. in length; (2) as soon as the clusters are formed; (3) 15 days later; (4) shortly before or at the beginning of flowering; and (5) when flowering is practically at an end. Between the liquid treatments it is advisable to give some applications of a cupric dust.

SARTORIUS (O.). **Peronospora-Bekämpfung mit Staubmitteln in der Rebschule.** [*Peronospora* control with dusts in the Vine nursery.]—*Der Deutsche Weinbau, 1931*, 16, p. 147, 1931. [Abs. in *Neuh. auf dem Geb. des Pflanzensch., 1931*, 3, p. 73, 1931.]

Hybrid vines (Portuguese × 3309) receiving 11 applications of cusisa dust [*R.A.M.*, viii, p. 85] in a vine nursery in the Palatinate during 1930 showed more infections by *Peronospora* [*Plasmopara viticola*] than those sprayed 8 times with 1 per cent. Bordeaux mixture. On the other hand, the growth of the dusted vines was much less impeded by the treatment than that of the sprayed ones.

BERTÈS (P.). **Traitement au sulfate de fer en viticulture.** [Treatment with iron sulphate in viticulture.]—*La Vie Agric. et Rurale*, xx, 22, pp. 343–344, 4 figs., 1931.

Popular notes are given on the use of iron sulphate against various diseases and pests of the vine in France, e.g., chlorosis [*R.A.M.*, viii, p. 544; x, p. 676] and anthracnose (*Gloeosporium ampelophagum*) [ibid., x, p. 75]. In the former case the material should be applied to the stems at a strength of 30 per cent. about the end of November, while in the following summer it should be dusted over the vines at a concentration of 1 per cent. In the latter a solution of 35 per cent. iron sulphate plus 2 l. of sulphuric acid per hectol. of water should be applied to the stems during the winter.

DREYER (D. J.). **Guide to the grading of Grapes for export.**—*South Africa Dept. of Agric. Bull.* 87, 4 pp., 13 pl., 1 graph, 1931. [Afrikaans translation.]

The chief organisms associated with wastage in South African grapes exported to overseas markets are stated to be *Botrytis cinerea*, *Rhizopus nigricans*, *Penicillium* spp., *Aspergillus* sp., yeasts, and bacteria [cf. *R.A.M.*, viii, p. 704].

Plantesygdomme i Danmark 1930. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1930. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. for Planteavl*, xxxvii, 3, pp. 458–508, 8 figs., 2 graphs, 1931. [English summary.]

This report (compiled by E. Gram and Miss Anna Weber in co-operation with a number of correspondents in various parts of Denmark) is prepared on the usual lines [*R.A.M.*, ix, p. 701]. Reclamation disease of oats and other crops was widespread; the application of copper sulphate (50 kg. per hect.), gave beneficial results in many cases, increasing the yield of barley by 422 kg. per hect. and that of oats by 611 kg. (average of 26 experiments in Jutland). Indications of satisfactory control by manganese sulphate and raphanit (a copper-containing weed-killer) were also obtained. Rye, wheat, and beets were extensively affected by grey speck, which was successfully treated by manganese sulphate; the similar condition observed in 1928 on strawberries at Farum [ibid., viii, p. 751] was also cured by this compound applied at the rate of 30 kg. per hect. Oats in two districts (Varde and Aalborg) suffered from soil acidity disease [ibid., vi, p. 51 *et passim*]; the hydrogen-ion concentration of the soil in the former locality was P_H 4 to 4·16 and in the latter 6·3 to 6·4.

Tomato streak or stripe [ibid., x, p. 536] was prevalent in glass-houses, causing heavy losses. There was some evidence that the virus is carried by the seed and is also spread by pruning and similar operations; in most plants only the tops were affected. Infection was most severe in the warmest parts of the house. In houses where both mosaic and stripe were abundant during April and May, only the former was still apparent at the end of July. A number of melons contracted mosaic which is thought to have spread to them from the diseased tomatoes.

The following records are new for Denmark. Elm branches submitted for examination were attacked by a species of *Aposphaeria* (? *ulmicola*), occurring on the shoot tips and round the buds. Young wheat leaves showed a brown spotting and old ones were shrivelled as a result of infection by an undescribed species of *Ascochyta* with exceptionally large conidia. *Diplodina oudemansii* was observed on gooseberry twigs and *Coryneum longistipitatum* in necrotic areas round the buds on pear branches.

Bericht der Lehr- und Forschungsanstalt für Gartenbau in Berlin-Dahlem für das Rechnungsjahr 1930. [Report of the Horticultural College and Research Institute in Berlin-Dahlem for the financial year 1930.]—*Landw. Jahrb.*, lxxiv, Supplement 1, pp. 299–373, 9 figs., 2 graphs, 1931.

This report [cf. *R.A.M.*, ix, p. 764] contains a number of items of phytopathological interest of which the following may be mentioned. Observations on the effect of lime applications on the incidence of the rose diseases due to *Sphaerotheca pannosa*, *Phragmidium subcorticium* [*P. mucronatum*], and *Actinonema* [*Diplocarpon*] *rosae* showed that infection by these fungi was most severe on areas with a soil reaction below P_H 7·0.

Good results in the combined control of apple and pear scab

(*Venturia inaequalis* and *V. pirina*) and fruit moth (*Carpocapsa* [*Cydia*] *pomonella*) were given by spraying with nosprasit, one application usually sufficing.

Two applications of vomasol C with a small admixture of soft soap, coupled with the removal of dead material, turning over the soil and covering it with peat mould, appear to have effectively prevented further attacks of *Pestalozzia guepini* in experimental rhododendron plantings [*R.A.M.*, ix, p. 389]. Similar treatment was also successful against leaf fall [*Lophodermium pinastri*] of conifers (*Abies concolor*, *Picea glauca*, and *P. argentea*).

Jahresbericht der Preussischen Landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe). Jahrgang 1930–31. [Annual Report of the Prussian Agricultural Experiment and Research Institutes at Landsberg a. d. Warthe. Year 1930–31.]—*Landw. Jahrb.*, lxxiv, Supplement 1, pp. 1–110, 1 diag., 1931.

The phytopathological section of this report (pp. 48–65), prepared by Prof. Schander and his collaborators, contains the following among other items of interest. By means of Arland's gasometric method the transpiration of potato leaves suffering from leaf roll was found to correspond to an abnormal intensity of respiration, both processes being governed by an abnormal stomatal movement. No constant differences could be detected between the total osmotic capacity of the expressed saps of leaf roll and healthy tubers. The pressure distribution consequent on the special permeability relations of the whole organism appears to be of primary importance.

Of 8 early and medium-early, and 33 medium-late and late potato varieties immune from wart disease [*Synchytrium endobioticum*] tested in 1930, the highest yield in the former group was given by Berlichingen (418 doppelzentner per hect.) and in the latter by Ackersegen (507 doppelzentner per hect.), followed by Pepo, Sickingen, Cellini, and Preussen (497, 484, 466, and 461, respectively).

None of the six preparations used in a two-years' campaign against finger-and-toe disease of cabbage [*Plasmodiophora brassicae*] proved superior to heavy applications of caustic lime to the soil for this purpose.

Tests in the control of apple scab [*Venturia inaequalis*] gave similar results to those of the previous year [*R.A.M.*, xi, p. 764].

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu Geisenheim a. Rh. für das Rechnungsjahr 1930. [Report of the Viticultural, Pomicultural, and Horticultural College and Research Institute at Geisenheim a. Rh. for the financial year 1930.]—*Landw. Jahrb.*, lxxiv, Supplement 1, pp. 375–442, 1 graph, 1931.

Among other items of phytopathological interest in this report the following may be mentioned. Further tests of vine seedlings for resistance to downy mildew (*Plasmopara viticola*) in the field showed that various families of the American Riparia and

Rupestris vines are virtually immune from this disease [*R.A.M.*, ix, p. 764].

The following preparations were effective against *P. viticola*: Kupferkalk [copper-lime] Wacker, 1 per cent. (A. Wacker, Munich); Sch. 911, 0·5 per cent. (I. G. Farbenindustrie A. G., Höchst a. M.); Kupferarsenspritzmittel [copper arsenic spray] 240, 1 per cent. (Spiess & Sohn, Kleinkarlbach, Pfalz); Mittel 124 (Pulver) (Dr. Nördlinger, Flörsheim a. M.); Kupferstaub [copper dust] (Schering-Kahlbaum A. G., Berlin); Kupferstaub P. 210 (Pflanzenschutz, Schweinfurt a. M.); cusisa 1929 (Pulver) (E. Merck, Darmstadt) [ibid., x, p. 582].

Mulberry shoots showed elongated black spots, 1 to 4 cm. in extent, which were found to be due to *Bacillus* (*Pseudomonas*) [*Bacterium*] *mori* [ibid., x, p. 347], not hitherto recorded in Germany. The lesions were mostly torn and the resulting wounds penetrated to the interior of the shoots.

Four strains of *Graphium ulmi*, viz., two isolated at Geisenheim, one from Wollenweber, Berlin, and one from Miss Westerdijk, Baarn, Holland, were inoculated by injection into *Ulmus hollandica* and *U. campestris* with positive results. Two out of three branches ringed with wire before inoculation rapidly succumbed, showing the symptoms of acute die-back (shrivelling of all the leaves on a shoot). Other branches inoculated without ringing showed only wilting and subsequent partial desiccation.

CUNNINGHAM (G. H.). **Additions to the recorded plant diseases of New Zealand.**—*New Zealand Journ. of Agric.*, xlii, 5, pp. 305–306, 1931.

In this paper brief notes are given on diseases of plants which have been recorded in New Zealand, apparently for the first time, during 1930, and among which the following may be cited. *Fusarium conglutinans* var. *callistephi* on Chinese asters; *F. dianthi* on carnations; *Macrosporium tabacinum* [*Alternaria tabacina*: *R.A.M.*, x, p. 212] on tobacco leaves and seeds; *Phyllachora pastinacae* on parsnip; *Phlyctaena linicola* on linseed; *Phoma persicae* on peach trees; *Phomopsis citri* on lemon fruits; and *Verticillium albo-atrum* on potato tubers and stems.

LEACH (R.). **Report of the Mycologist for 1930.**—*Ann. Rept. Dept. of Agric., Nyasaland, 1930*, pp. 32–34, 1931.

Investigations on tea yellows were conducted in collaboration with Dr. H. H. Storey, Plant Pathologist of the East African Agricultural Research Station, Amani. The symptoms of this disease may be recognized in four distinct phases, viz., (1) the leaves, especially at the apices of the shoots, become chlorotic and mottled. (2) This effect is intensified and may be accompanied by a reduction in the size of the leaves to less than a quarter of their normal dimensions; the lower leaves on the shoots begin to fall, and the internodes become progressively shorter as growth

continues. (3) Only diminutive chlorotic buds remain at the apices of the shoots, which are thin and whip-like; a few dormant buds, in the axils of the leaf scars below, begin to shoot but also give rise to small chlorotic shoots. (4) The leafless shoots die back from the apex; the whole bush may appear dead, but closer examination often reveals a few isolated chlorotic buds at the base of the branches. The disease may kill the plants within a year, but normally its progress is slow [cf. *R.A.M.*, viii, p. 203].

Die-back, which has been shown by preliminary inoculation experiments to be associated with a species of *Stilbella* closely related to *S. theae* [ibid., iii, p. 4], appears at the beginning of the hot season (middle of September) and continues until the start of the rains (middle of November), after which it declines in severity.

Negative results were given by inoculation experiments with two species of *Phoma*, *Macrophoma* sp., *Colletotrichum* sp., *Pestalozzia* sp., and *Glomerella* sp., isolated from tea stem and branch cankers [ibid., viii, p. 204]. Attempts to isolate a fungus or bacterium from the earliest stage of the disease were also unsuccessful. Nine months' observations showed that the canker does not travel downwards into the root, but fresh cankers can be formed in succession up the stem as the latter grows.

Violet root disease, caused by a species of *Rhizoctonia*, possibly the sterile stage of *Helicobasidium longisporum* [ibid., viii, p. 203], was fairly prevalent in tea nurseries during 1930, killing over 1,000 eighteen-month-old plants in one nursery in the course of three months. So far only young plants have been found affected by violet root rot, and it is not known whether the fungus can attack older ones.

Nyasaland has hitherto been regarded as free from leaf rust of coffee (*Hemileia vastatrix*), but close inquiry has shown that the disease was present in the past, though not reported to the Department.

A small olive plantation just coming into bearing was found to be severely injured by *Armillaria*, causing a wet rot of the roots and cracking of the stem at the collar of the trees [cf. ibid., viii, p. 202].

Work connected with insect and fungus pests and their control. Tomatoes. Fungoid diseases.—*Rept. Agric. Dept., St. Vincent, for the year 1930*, pp. 9–10, 1931.

In 1930 tomatoes in St. Vincent were attacked by blossom-end rot [*R.A.M.*, viii, p. 426]; the disease is prevalent throughout the West Indies and is found on plants in all types of soil. Not much leaf spot (*Septoria lycopersici*) was seen, but past experience has shown that the disease can be severe in this locality. A bacterial wilt in which the plants showed symptoms resembling those which might be expected to develop if the base of the stem were severed from the roots was moderately common. Destructive effects on tomato fruits of any age are sometimes produced by a so-called 'bubbly fruit rot'; watery bubbles form under the transparent skin and the whole content of the fruit except the

seed, is reduced to slime. The infection, the cause of which is not known, takes place through wounds.

[DUPONT (P. R.).] **Entomological and mycological notes.**—*Ann. Rept. Seychelles Dept. of Agric. for the year 1930*, pp. 11–13, 1931.

The following are among the specimens of parasitic fungi in the Seychelles identified during the year. A species of *Marasmius* closely resembling *M. palmivorus*, the cause of severe injury to coco-nut palms in Malaya [*R.A.M.*, viii, p. 305]; *Fomes rimosus* [ibid., v, p. 452] on white mangrove (*Avicennia officinalis*); *Sphaerostilbe coccidophthora* on [scale insects on] mango twigs and coco-nut leaves; and *Verticillium heterocladum* [ibid., vi, p. 419] on *Aspidiotus ficus* [*Chrysomphalus aonidum*]. It is pointed out that *S. coccidophthora* resembles the newly introduced *Pseudomicrocera* [*henningsii*] which, with its perfect form *Nectria diploa* [loc. cit.], was found about the time of the introduction of cultures in localities at a distance, and so far has parasitized the coco-nut thread scales, *Ichnaspis longirostris*, in four places.

NÁBELEK (V.). **Der Krebsproblem der Pflanze.** [The cancer problem of the plant.]—40 pp., 7 pl., Prague, 1930. (Czecho-Slovakian, with German summary.)

The writer discusses the reaction processes of branches of plants inoculated through cuts by emulsions of *Bacterium tumefaciens* and other organisms placed on the wounded surface, in contrast with those that take place in normal wound healing.

The unrestricted growth of the wound wood consequent on inoculation with *Bact. tumefaciens* involves a disorganization of the correlations which normally govern the habit of the plant. The surface growth of the vegetative cone does not appear to be disturbed. Wound meristems form new growth centres without preformed delimitation. In infection with *Bact. tumefaciens* the increasing numbers of bacteria promote the unlimited surface growth of the wound meristems. The absence of morphogenesis in the wound meristems exposes the plants to disorganization through external influences, frequently involving tumour formation of a 'benign' character. In the early stages of this process individual cells undergo a final differentiation (metaplasy into tracheids in the case of *Pelargonium*). The cessation of differentiation involves endless linear growth ('tumour strands'); single cells of these rows are capable of division in every direction, a process ultimately leading to the final stage of the tumour, which is comparable to malignant human tumours.

The following conditions are necessary for the formation of bacterial tumours. The bacteria must be capable of intercellular penetration by the dissolution of the middle lamella; they must further be in a state of active multiplication; and must not destroy the cells, in which case decay sets in. Wound cork formation must not be stimulated, since it inhibits tumour formation. [The German summary of this paper is reprinted in *Práce Učené Společnosti Šafaříkovy*, Bratislau, II, 16 pp., 8 pl., 1930.]

RIVERA (V.). **Fattori eccitativi dell'accrescimento di neoplasmi vegetali da B. tumefaciens.** [Factors stimulating the growth of plant neoplasms produced by *Bacterium tumefaciens.*]—*Rendic. R. Accad. Lincei*, xiii, Ser. VI, 8, pp. 621–627, 2 figs., **1931.**

After referring to the recent paper by Riker and his collaborators on the organism causing infectious hairy root of apple [*Phytomonas rhizogenes*: *R.A.M.*, x, p. 166], the author describes an experiment in which *Pelargonium* seedlings inoculated with *Bacterium tumefaciens* were kept for periods ranging from 10 to 30 days with the inoculated parts enclosed in a hermetically sealed box, in a similar lead box enclosed within another, and in a third lead box the same size as the first but lined throughout with black paper; wooden boxes of the same dimensions as the lead ones, and lined throughout with black paper, were also used in control tests. The whole experiment was repeated, with identical results, on four separate occasions in different seasons.

When brought again into the light none of the seedlings from the wooden containers showed any trace of neoplastic formation near the point of inoculation, but all those taken from the lead containers presented well-developed neoplasms with long, geotropically positive aerial roots of normal structure and provided with a root-cap and root hairs. Both the neoplasm and the aerial roots were best developed in the plants kept in the double lead container, less so in those kept in the single lead container, and were least developed in the plants from the paper-lined lead box.

Further tests were then carried out in which the inoculated seedlings were kept for 50 days (during March and April) in containers made of wood, glass, and various metals. It was then ascertained that a rapid and very marked development of aerial roots had taken place in the seedlings kept in single or double lead containers while a slower and less-marked development of aerial roots had occurred in the plants kept in paper-lined lead containers, iron containers, and a glass container inside a wooden one. No aerial roots developed on seedlings in zinc and wooden containers. In some of the plants aerial roots grew out from normal stems, as well as from the neoplastic tissues. This is considered as affording confirmation of the view that the emission of the aerial roots in these experiments was brought about solely as a result of the special environmental conditions in which the aerial parts of the seedlings were growing.

In the author's opinion, the phenomena noted may be attributed to three main causes. The first of these is the different humidities within the various containers, that in the lead ones being about 81 to 83 per cent., while that in the wooden ones was about 65 to 70 per cent. of saturation. Secondly, the complete absence of light acting on tissues parasitized by *Bact. tumefaciens* probably accelerated cellular proliferation. The lead screens probably cut off more of the light than did the wood, which would partly explain the faster growth of the neoplastic tissues in the plants in the lead containers. A third, and perhaps equally important factor, was the ionization of the air in the containers, directly brought about by the ultra-gamma rays, since various metals, including zinc and

lead, not only absorb but also diffuse these rays. Further, such ionization may increase the atmospheric humidity inside the metal containers and so stimulate growth. Lastly, the small amount of cosmic radiation absorbed by the metal may have given rise to secondary radiation which, acting both on the healthy and diseased plant tissues, contributed to the results obtained.

MEHTA (K. C.). **The cereal-rust problem in India.**—*Indian Journ. Agric. Sci.*, i, 3, pp. 302–304, 1931.

The results of the writer's previous work on the problem of the annual recurrence of the black and brown rusts of wheat [*Puccinia graminis* and *P. triticina*] and the yellow rust of barley [*P. glumarum*: *R.A.M.*, viii, p. 489 and next abstract] are briefly recapitulated. A corroboration of the view that infection reaches the plains from the lower mountain altitudes, where the mild winters facilitate the survival of the uredospores of the rusts, has recently been obtained at Almora (nearly 5,000 ft. above sea level) where both *P. graminis* and *P. triticina* remained viable in the open from the beginning of May, 1930, until the time of writing (23rd February, 1931). Recent work has further shown that these two rusts are unable to survive the intensely cold winters at Muktesar (7,600 ft.). It is considered probable that *P. graminis* and *P. triticina* are able to pass the summer even at altitudes slightly lower than that of Almora, the former being particularly resistant to warm weather. *P. glumarum*, on the other hand, can stand the cold well, but is only able to survive the summer at high altitudes.

The problem of the control of these rusts is greatly simplified by the absence in the plains (covering nearly 95 per cent. of the area under cereal cultivation in India) of barberry and *Thalictrum* spp., the alternate hosts of *P. graminis* and *P. triticina*, respectively. Further work is necessary to determine the part (if any) played by the alternate hosts at higher altitudes, and also on various other aspects of the cereal rust question, including a study of the regional distribution of the different physiologic forms and their pathogenicity to the standard Indian wheat varieties.

MEHTA (K. C.). **Annual outbreaks of rusts on Wheat and Barley in the plains of India.**—*Indian Journ. Agric. Sci.*, i, 3, pp. 297–301, 1931.

Continuing his investigations on the causes underlying the annual outbreaks of black rust of wheat and barley (*Puccinia graminis*), brown rust of wheat (*P. triticina*), and yellow rust of barley (*P. glumarum*) in India [see preceding abstract], the writer briefly outlines the information available to date on this problem.

The recurrence of *P. glumarum* is more readily explicable than that of the other two rusts notwithstanding the absence of an intermediate host. The yellow rust survives the summer in the uredo stage on self-sown plants at and above 7,000 ft., so that plentiful sources of infection exist at the time of sowing. After the infection of the new crop in the hills, the mycelium appears to grow intermittently during November and December, uredosori breaking out again, after a long incubation period, in the end of

December or January. Probably outbreaks of yellow rust at Muktesar in the Kumaon Himalaya and other places at similar altitudes are responsible for subsequent infections on the plains due to wind-blown uredospores. Neither *P. graminis* nor *P. triticina* can survive the cold at these heights.

A few species of *Thalictrum*, the alternate host of *P. triticina*, occur in the hills, but aecidia are rarely found on them. Most of the aecidia producing witches' brooms on barberry, which also grows at high altitudes, are those of *Aecidium montanum*. So far the writer has not detected the aecidia of *P. graminis* or *P. triticina* on their alternate hosts in the area under observation in Kumaon and the Simla hills, but viable uredospores of both rusts may be found in the hills during the critical period. The rusts appear on the plains by the beginning of February, i.e., six weeks to two months earlier than at Simla or Muktesar. It is evident, therefore, that the aecidia found in the hills from March to August play no direct part in the infection of the crops on the plains, to which the rusts are probably conveyed from lower altitudes by means of uredospores. At the foot of the hills near Nepal both the black and brown rusts were observed as early as the end of January, 1931, and it is proposed to extend the work to that territory.

Promising results have been given by preliminary observations, made in co-operation with the Meteorological Department of India and the Royal Air Force at Ambala, on the method of rust dissemination. Slides were exposed on aeroscopes and sent up on hydrogen balloons [see next abstract]. Uredospores of *P. graminis* were caught at Agra [in the plains of the United Provinces] on a slide sent up in a balloon and on another exposed in an aeroscope two and three weeks, respectively, before the appearance of the disease on the crops. One of the slides exposed at Lyallpur [in the Punjab plains] caught spores of *P. triticina* a fortnight before brown rust developed on the wheat crop.

A few suggestions are made regarding the control of the rusts, the annual loss from which in India was estimated nearly twenty-five years ago at £3,000,000.

CHATTERJEE (G.). **A note on an apparatus for catching spores from the upper air.**—*Indian Journ. Agric. Sci.*, i, 3, pp. 306–308, 2 pl., 1931.

In connexion with experiments on the mode of dissemination of the wheat rusts [*Puccinia graminis* and *P. triticina*] in India [see preceding abstracts], an apparatus is described consisting of a slide which is automatically exposed, by the burning of a fuse, to a current of air when the balloon to which it is attached reaches a certain height [cf. *R.A.M.*, viii, p. 360]. The slide holder is automatically closed again before the balloon begins to descend.

MACINDOE (S. L.). **Stem rust of Wheat. Observations at Glen Innes during the 1930–31 season.**—*Agric. Gaz. New South Wales*, xlii, 6, pp. 475–484, 1931.

Stem rust of wheat (*Puccinia graminis tritici*) is stated to have attained epidemic dimensions over a considerable portion of

the wheat belt in New South Wales in 1930–1, this being ascribed, in part at least, to the rather heavy rainfall during the critical month of October. The infection was particularly severe in the plant-breeding plots of the New England Experiment Farm at Glen Innes, and this favoured the accurate observation of the relative resistance to the rust of a wide range of local and imported species and varieties of wheat (both pure- and cross-bred). The results are given in tables showing the reactions of the individual varieties, and indicate that no local bread wheats of high productivity, such as Federation, Canberra, Waratah, and the like, possess any marked degree of resistance, while most of them are highly susceptible. Among imported varieties three Kenya cross-breds gave good promise of usefulness in New South Wales, and were either entirely immune from or very resistant to the rust; they need, however, to be tested further for productiveness.

EZEKIEL (W. N.). **Studies on the nature of physiologic resistance to Puccinia graminis tritici.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 67, 62 pp., 4 figs., 7 graphs, 1930. [Received August, 1931.]

The investigation fully described in this paper was conducted for the purpose of obtaining some direct information on the nature of resistance in wheat to stem rust (*Puccinia graminis tritici*) by means of the study of the growth of the parasite in extracts from resistant and susceptible wheat plants and on other substrata. As a general result it was shown that the different physiological forms of the rust differed in their cultural characteristics, such as length of germ-tubes, type of growth, and abundance of branching, in hanging drop cultures, these characteristics being constant for given strains under controlled conditions. It is pointed out, however, that the studies were only on the growth produced from uredospores, and that it still remains to be shown whether the differences noted are true of all isolations of a given form or are characteristic merely of those studied. There was a high positive correlation between the number of uredospores present in a hanging drop and the final length of germ-tube per spore. Apical swellings on the tips of germ-tubes were produced by the different physiological forms in approximately the same relative abundance as normal teleutospores on infected wheat plants; from their structure these bodies are considered to be probably immature teleutospores.

Green plant extracts prepared from different wheat varieties varied in their ability to support the growth of the physiological forms in exact agreement with the respective resistance or susceptibility of the varieties to the various forms. This applied to all the forms of *P. g. tritici* tested, with the exception of form 39 and of those forms to which Vernal emmer is susceptible, and is thought to indicate that there are at least two series of relations involved in resistance to the fungus, unless these forms differ from the majority in some minor responses to environmental conditions. In one single experiment the differentiation was greater with extracts from infected plants than in extracts from healthy plants, indicating the possibility that antibodies are formed in the host tissues. The extracts retained their differentiating capacity at

considerable dilutions and after storage in the refrigerator for eight months, but heating appeared to reduce their efficacy. Filtration through a single sterile filter paper produced extracts of greater differentiating activity as to lengths of germ-tubes but of less value with regard to differences in the branching of the germ-tubes.

McDonald (J.). **The existence of physiologic forms of Wheat stem rust in Africa.**—*Trans. Brit. Mycol. Soc.*, xv, 3–4, pp. 235–247, 1 pl., 1 map, 1931.

This is an expanded version of the author's recent accounts of the investigation of stem rust (*Puccinia graminis tritici*) of wheat in Kenya, abstracts of which have already been given from other sources [*R.A.M.*, x, p. 507].

Greaney (F. G.). **The influence on yield and grade of harvesting rusted Wheat at different stages of maturity.**—*Scient. Agric.*, xi, 8, pp. 492–511, 2 figs., 1931.

The results of field experiments [which are described and fully discussed] from 1927 to 1929 in Manitoba, in which Marquis wheat, exhibiting varying degrees of infection with leaf rust (*Puccinia triticina*) and stem rust (*P. graminis tritici*), was harvested at different stages of maturity, showed that in each year the yield was significantly reduced by premature cutting. The quality of the grain, as indicated by weight per bushel and by the weight of 1,000 grains, was markedly improved by allowing the plants to reach full maturity, while the percentage of green and shrivelled grains was reduced. There was no indication that food substances stored temporarily in the wheat leaves and stems were translocated to any appreciable degree to the grain after immature wheat had been cut. It is pointed out that in 1927 and 1929 stem rust developed rapidly in the experimental field, and its destructiveness increased as the wheat approached maturity, but even under such conditions the yield and quality of the wheat reaped prematurely were significantly inferior to those of the more heavily rusted wheat which was cut at the normal time.

Although it was demonstrated that rust is an important factor in reducing yield and lowering the quality of the crop, the investigation fully confirmed Harrington's conclusion [*R.A.M.*, vii, p. 568] that there is no foundation for the popular view that rusted wheat should be harvested early.

Wilhelm (P.). **Studien zur Spezialisierungsweise des Weizengelbrostes, Puccinia glumarum f. sp. tritici (Schmidt) Erikss. et Henn. und zur Keimungsphysiologie seiner Uredosporen.** [Studies on the mode of specialization of the yellow rust of Wheat, *Puccinia glumarum* f. sp. *tritici* (Schmidt) Erikss. & Henn. and on the physiology of the germination of its uredospores.]—*Arb. Biol. Reichsanst. für Land- und Forstw.*, xix, 1, pp. 95–133, 2 figs., 2 graphs, 1931.

Full details, accompanied by 11 tables, are given of the writer's investigations, conducted in Berlin-Dahlem from 1928 to 1930, on biological specialization in yellow rust of wheat (*Puccinia

glumarum f. sp. *tritici*), and on the physiological factors governing uredospore germination in this organism [*R.A.M.*, ix, p. 514; x, p. 441].

The occurrence of five biologic forms was definitely established by a study of the reaction of ten varieties of wheat, selected as standard test varieties, to five German collections of the rust, one Dutch, one Swedish, and one French. Biologic form I from Svalöf, Sweden, is characterized by a high degree of virulence on Svalöfs Panzer III, while all the other varieties tested, viz., three unnamed but numbered American C.I. varieties, three Vilmorins (including Bon Fermier), Golden Drop, and Carstens Dickkopf V were more or less resistant to this form. Form II from Noissy-le-Roi attacked one unnamed variety (C.I. 3778), the three Vilmorins, and Golden Drop with great severity, while the others were resistant. Form III from Dahlem was very virulent on the three unnamed varieties and Webster, C.I. 3780, the six others being resistant. Form IV from Giessen was virulent only on one of the unnamed varieties (C.I. 3778), while form V from Schlanstedt attacked the three unnamed varieties, Webster, and Dickkopf very severely. In a further test form II was very virulent on Kinney, Blé des Alliés, and Japhet, while Strube's Neuzüchtung 3186 and Hertha were resistant. Form V, on the other hand, attacked the two last-named with great severity, while the three others were resistant. The varieties White Federation Cal. 3213, Bunyip Cal. 3203, Bishop, Wash. 143, and Prelude, which were found resistant to *P. glumarum* in Canada [ibid., viii, p. 492], proved highly susceptible to all the writer's collections. In no case did several biologic forms occur within the same rust population as has been found to occur in brown rust of wheat (*P. triticina*) and crown rust of oats (*P. coronifera*) [*P. lolii*: ibid., ix, pp. 768, 770].

P. glumarum is more sensitive than the other cereal rusts to certain environmental factors. It was shown by greenhouse experiments in which wheat plants of the ten above-mentioned standard varieties were kept at three different temperatures and relative humidities, viz., 8° to 12° C. with 75 to 80 per cent. relative humidity, 10° to 23° with 60 to 75 per cent., and 25° and over with 55 to 65 per cent., that resistance to physiologic forms II, III, and IV generally increased at comparatively high temperatures and declined at low ones. The Vilmorin Gros Bleu and Bon Fermier varieties and Golden Drop, however, proved to be exceptions to this rule, maintaining their resistance even at low temperatures. The differences in humidity had no very marked effect on the reaction to the rust (the plants were kept in a moist chamber for 48 hours after inoculation in every case before being transferred to the controlled chambers), though the degree of infection was lowered in most cases in the driest chamber. Reductions in the intensity of light also prevented the full expression of the grade of infection but did not affect the relative susceptibility of the different varieties. Modifications in the expression of the symptoms were further induced by variations in the spore concentration of the suspension used as inoculum, so that care should be taken to keep this uniform.

Inoculation experiments with the above-mentioned physiologic

forms on *Hordeum jubatum* and *H. murinum* gave positive results only with form IV on the first-named.

The optimum temperatures for the germination of the uredospores of *P. glumarum* were found to range from 10° to 20°. Between 10° and 5° there is a sharp decline in the rate of germination but none in general viability, which only begins to diminish below 5° [cf. ibid., iii, p. 21]. The rate of germination was found to be slower in *P. glumarum* than in the other cereal rusts tested and the incubation period was 12 days compared with 10 for *P. graminis*, 8 to 9 for *P. lolii*, 8 for *P. triticina*, and 7 for *P. dispersa* [*P. secalina*]. Uredospores developing on plants deprived of a sufficiency of light were neither viable nor capable of causing infection, the same applying to those produced near the minimum and maximum temperatures for growth. Only a slight degree of viability was shown by uredospores developing under excessively humid conditions. Young uredospores and those remaining more than eight days on the leaves showed a delay in germination and a partial loss of viability.

The germinative capacity of the uredospores of *P. glumarum* was stimulated by ammonium and potassium phosphate (0·01 to 0·1 mol.) and by cane sugar and glycocol at the same strength; ammonium chloride (0·01) also caused a slight acceleration. Germination was entirely suppressed by ammonium and potassium carbonate and urea (0·01 to 0·2 mol.).

BRESSMAN (E. N.). **The present status of breeding varieties of Wheat resistant to bunt.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxiii, 23–26, pp. 396-397, 1931.

Some of the more important aspects of the work of wheat breeding for resistance to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] are briefly discussed, with special reference to the studies on physiologic forms of the fungi now in progress at Corvallis, Oregon [*R.A.M.*, x, p. 372].

HOLTON (C. S.). **The relation of physiologic specialization in Tilletia to recent epiphytotics of bunt in durum and Marquis Wheats.**—*Phytopath.*, xxi, 6, pp. 687–694, 1 graph, 1931.

The writer's recent experiments [the results of which are tabulated and discussed] at St. Paul, Minnesota, have substantiated his previous conclusion that the recent epidemics of bunt in durum wheats and the formerly resistant Vernal emmer are due to the development of hitherto unknown physiologic forms of *Tilletia tritici* [*T. caries*: *R.A.M.*, ix, pp. 368, 636].

The tests described in this paper were carried out with four collections of *T. caries* from California, Manitoba, North Dakota, and Minnesota, and two of *T. levis* [*T. foetens*] from the last-named State. The first two, both probably belonging to the same form, did not readily infect durum or emmer; the North Dakota collection caused severe bunting of Mindum and Pentad durums; while that from Minnesota attacked Vernal emmer. Two physiologic forms of *T. foetens* were also identified on the basis of their effects on Kota, Ceres, Marquis, and Marquillo common wheats;

the St. Paul collection represents one form distinguishable by its high degree of virulence on Kota and Ceres and low infective capacity on Marquis and Marquillo, while the Ivanhoe collection is another form attacking all four varieties severely. Field observations confirmed the experimental evidence to the effect that recent epidemics of bunt in Marquis wheat, formerly regarded as highly resistant, are due to the presence of a hitherto undescribed physiologic form, represented in the Ivanhoe collection, of *T. foetens* [cf. ibid., x, p. 19]. Under field conditions in Minnesota at the present time, *T. foetens* is the predominant species on Marquis, and *T. caries* on Mindum and Vernal, and the author's experimental results showed that Marquis is susceptible to *T. foetens* and highly resistant to *T. caries*, while the reverse holds good for Mindum and Vernal.

HASKELL (R. J.) & BOERNER (E. G.). **Relation of stinking smut of Wheat in the field to smuttiness of threshed grain.**—*Plant Disease Reporter, Supplement* 79, pp. 1–5, 1 pl., 1 diag., 1931. [Mimeographed.]

At the conclusion of the survey made during the summer of 1930 in the wheat fields of Minnesota, North and South Dakota, and Montana to ascertain the causes of the increased prevalence of bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, x, p. 229 and last abstract], an attempt was made to determine the correlation between the incidence of infection in the field and the official grading for smut of the threshed grain.

On the basis of preliminary counts of 52 samples it may provisionally be assumed that 'light' smut (involving a discount of 1 to 2 cents per bushel) corresponds to a field loss of about 6 per cent., 'medium' smut (discount up to 10 cents per bushel) to 8 per cent. loss of stand, and 'heavy' smut (discount of 20 cents or more per bushel) to a field loss of 12 per cent. or above.

In the spring-wheat areas of the United States and Canada it has repeatedly been observed of recent years that the durum varieties show a higher average of infection than the hard red ones [ibid., x, p. 444]. In the grading tests under discussion, 36 per cent. of the 33 samples of hard red varieties were infected and 53 per cent. of the 19 durums. The percentage of heavy smut was also higher in the latter class (26 compared with 18 per cent.).

MILAN (A.). **Il grado di recettività per la 'carie' delle varietà di Frumento (III Nota).** [The degree of susceptibility to bunt of Wheat varieties (3rd note).]—*Nuov. Giorn. Bot. Ital.*, N.S., xxxviii, 1, pp. 142–154, 4 graphs, 1931.

In pursuance of his earlier investigations [*R.A.M.*, viii, p. 94] the author conducted tests [which are described, and the results of which are tabulated, expressed graphically, and discussed] in which the seed of various [named] varieties of wheat, artificially infected with bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] was sown thickly and thinly on dates between 19th October and 20th November, 1930. All the wheat sown on the latter date subsequently developed very much more bunt than that sown on the earlier date. In the thickly sown plots the

figures for the two dates were, for Gentile rosso mutico 37·5 and 96·1 per cent. bunted ears, for Ardito 19 and 74·6, and for Villa Glori 2 and 42·8 per cent., respectively. This result is attributed chiefly to the different temperatures prevailing in the two germinative periods.

Convincing evidence was also obtained that, under comparable conditions, plants from contaminated seed thinly sown (single, well-spaced seeding) will develop less bunt than plants from contaminated seed sown thickly (as in clumps of six or eight). In the author's opinion this difference is closely related to the greater facility for coming to a head possessed by the plants from seed thinly sown.

Comparing the plots thickly sown on 20th November, the author found that Gentile rosso mutico, Semiaristato fam. 48, and Inallettabile fam. 96 all showed over 90 per cent. infected ears; Mentana and Ardito showed, respectively, 86·5 and 74·6 per cent. infected ears; while Villa Glori was resistant (42·8 per cent. infected ears) and Fausto Sestini highly resistant with 10 per cent. infection; in the earliest-sown plot the last-named variety actually showed only 0·7 per cent. infected ears.

Wheat seed disinfected by the hot water method against *Ustilago tritici* and then infected with *T. caries* and *T. foetens* developed less bunt than did untreated seed, in spite of the retarded germination of the treated seed.

ZADE [A.]. **Der latente Pilzbefall und seine Folgeerscheinungen mit Bezug auf Sortenimmunität und Reizwirkung.** [Latent fungous infection and its sequels with regard to varietal immunity and stimulatory action.]—*Fortschr. der Landw.*, vi, 12, pp. 388–391, 1931.

The writer contrasts 'latent infection', which he defines as the permeation of the host by the mycelium of a fungus without spore formation, with the 'open' type of infection, characterized by sporulation on the external organs of the plant.

In the case of certain cereal diseases, latent infection may involve marked shortening of the haulms and other disturbances of growth, leading to serious reductions of yield. In an experiment in which an ostensibly 'immune' wheat variety, viz., Heil's Dickkopf, was exposed to infection by bunt [*Tilletia caries* and *T. foetens*], latent infection was sufficiently severe to cause extensive weakening of the plants. 'Immunity', in this case, does not consist in the absence of infection but in the failure of the fungus to reach the stage of spore formation. The seed-grain of the reputedly immune varieties, therefore, should be disinfected in exactly the same way as that of the susceptible, since otherwise latent infection may result in a considerable reduction of the stand. Altogether the commercial value of the 'immune' varieties must be regarded, in the light of these investigations, as very restricted.

The stimulatory effect frequently ascribed (without any solid basis) to certain chemical fungicides is thought to be, at any rate partially, due to the suppression of latent infection in the immune varieties, resulting in a higher yield than that given by the untreated controls.

HEY (G. L.) & CARTER (J. E.). **The effect of ultra-violet light radiations on the vegetative growth of Wheat seedlings, and their infection by Erysiphe graminis.**—*Phytopath.*, xxi, 6, pp. 695–699, 1931.

Details are given of experiments conducted at the School of Agriculture, Cambridge, to test the effect of ultra-violet light irradiation on the growth of wheat seedlings, and their reaction to mildew (*Erysiphe graminis*) infection.

In one test healthy Little Joss (susceptible) and Persian Black (immune) seedlings in a heavily infected greenhouse were exposed during five days to a quartz mercury vapour lamp (Hanovia Artificial Alpine Sun, 2·5 amps., 210 volts) as follows: 1, 5, and 10 minutes once a day at 24 inches from the light; 1 and 5 minutes twice a day at the same distance; 1 minute once at 48 inches; and 1 minute twice at the same distance [cf. ibid., x, p, 332]. The day after the last irradiation all the Persian Black plants were free from mildew, those exposed to the rays for 1 minute daily at 48 inches being stronger and taller than any of the others. The Little Joss controls were badly mildewed, but the irradiated plants were almost, or quite, free from the fungus. A fortnight later all the Little Joss plants were badly mildewed, the controls being nearly killed.

In another experiment American Club (susceptible), Little Joss, and Persian Black seedlings were irradiated for 1 or 3 minutes daily for 15 days at a distance of 48 inches from the lamp. With the two susceptible varieties 1 minute's irradiation increased the growth of the seedlings, but hardly reduced the incidence of infection. On the other hand, irradiation for 3 minutes caused a reduction both in the growth of the plants and the development of the fungus. When irradiation was discontinued the plants became mildewed again. With Persian Black seedlings the effect of the treatment on growth was less apparent; in no case was the immunity of this variety impaired even by quantities of light producing severe scorching.

The light seems to act directly on the mycelium of the fungus, which is killed or rendered dormant. The organism was suppressed only on the side of the leaves exposed to the light, showing that the latter does not act indirectly on the metabolism of the host so as to render it immune or resistant. However, the increased growth attained by plants receiving certain quantities of light may exert an indirect effect by enabling the plants to flourish in spite of slight infection. Smaller quantities of light were required to keep clean plants free from disease than to kill the mildew fungus on infected ones, probably because the younger hyphae are more susceptible to the action of the rays than older ones. In the hot, dry summer of 1929, sufficient ultra-violet light was provided by the normal sunshine to produce a yield of 19·1 cwt. per acre, as compared with a ten-year average of 17·7 cwt. In 1930, on the contrary, the amount of sunshine was so slight that mildew flourished and the wheat crop suffered, while for the wet season of 1931 the yield is estimated at only 15·8 cwt. per acre. It is possible that the effect of the ultra-violet light on mildew is one of the factors influencing the yield in different seasons.

SANFORD (G. B.) & BROADFOOT (W. C.). **Studies of the effects of other soil-inhabiting micro-organisms on the virulence of Ophiobolus graminis Sacc.**—*Scient. Agric.*, xi, 8, pp. 512–528, 2 pl., 1 fig., 4 graphs, 1931.

Some details are given of experiments to determine the effect exerted on the pathogenicity of *Ophiobolus graminis* to wheat seedlings grown in pots by the addition to the soil inoculated with it of living cultures or culture filtrates of 26 species of fungi and 40 species of bacteria [a list of which is given], nearly all of which were isolated from soil [cf. *R.A.M.*, x, pp. 447, 681]. The results [which are presented in tabular form] showed that the infectivity of *O. graminis* was almost entirely, or very considerably, reduced by 6 of the species of fungi and 15 of bacteria; 7 species of fungi and 8 of bacteria gave intermediate control, and all the remaining organisms, which allowed over 20 per cent. of the seedlings to be infected by *O. graminis*, were classed as having no controlling effect on the latter. The pathogenicity of *O. graminis* was also well controlled by the culture filtrates of the *Penicillium* sp. and *Actinomyces* sp. tested, and of 6 species of bacteria; two further filtrates (one each of a fungus and of a bacterium) gave intermediate control, and the remaining filtrates gave much less protection to the seedlings, or even in some cases appreciably increased the injury done by the pathogen. None of the micro-organisms used in the experiments, nor their filtrates, appeared to affect the vigour of the wheat seedlings inoculated with them separately, this being considered to indicate that the reduction in the virulence of *O. graminis* was chiefly due to the toxicity to it of the living micro-organisms tested or of their filtrates. The latter appeared to be somewhat less effective in this respect than the living cultures.

SPRAGUE (R. A.). **Cercosporella herpotrichoides Fron, the cause of the Columbia basin footrot of winter Wheat.**—*Science*, N.S., lxxiv, 1906, pp. 51–53, 1931.

During the past eleven years an important foot rot of winter wheat and barley, the symptoms of which have already been partially described [*R.A.M.*, v, p. 223], has been under investigation in eastern Washington and Oregon. A fungus producing compact, smoke-grey mycelial colonies on Difco potato-dextrose agar was consistently isolated from young lesions in the basal nodes of the culms; during 1929 and 1930 profuse sporulation occurred in cornmeal cultures incubated out-of-doors at Corvallis, Oregon, enabling the organism to be identified as *Cercosporella herpotrichoides* Fron. Conidia were produced in slimy, pink masses (pseudopionnotes) at the edges of four-week-old colonies, and also developed on loosely formed coremial structures, on sporodochia or microsclerotia, and on independent hyphae. In less than a week the spores, germinating at one or both ends, produced the typical smoke-grey colonies on the above-mentioned medium.

In the early spring of 1930, spores of *C. herpotrichoides* were found on lesions at the culm bases of naturally infected wheat plants in the field near The Dalles, Oregon, as well as on artificially inoculated plants in the greenhouse at Corvallis. Inoculation experiments on wheat plants under field and greenhouse conditions,

by mixing fresh inoculum from monomycelial cultures on sterilized oats and barley kernels with the soil at sowing time or later, resulted in the typical foot rot symptoms. The causal organism was reisolated from the diseased plants. Uninoculated controls remained healthy.

The 'x' organism described by Foëx and Rosella on eye spot lesions on wheat in France has been found, by a comparison of pure cultures, to be microscopically identical in mycelial characters with *C. herpotrichoides* in Oregon [see next abstract].

The only ascigerous stage of a suspected pathogen found on wheat foot rot lesions in the Columbia Basin, apart from traces of *Ophiobolus graminis*, is *L. herpotrichoides*, occurring in Spokane County, Washington. A culture of a *Leptosphaeria* from Canada [ibid., ix, p. 28] examined by the writer was found to differ in appearance, growth rate, and pathogenicity from the French and Oregon strains of *C. herpotrichoides*.

No technical description of *C. herpotrichoides* was given by Fron, and correspondence has failed to reveal the existence of any type material. The writer concludes, however, from Fron's discussion and drawings, that his fungus is the same and an emended diagnosis of *C. herpotrichoides* is given in English. Two kinds of mycelium are formed, a vegetative of linear yellow to dark brown hyphae and a stromatic of polygon cells with thick walls forming charred masses on the surface of the base of the plant or in the cells of diseased tissues. The conidiophores are simple or slightly branched, sometimes swollen at the base ; the conidia, generally produced in the spring in pairs or singly on the lesions, are somewhat curved, obclavate, bi- to pluricellular (usually 5 to 7 celled), and measure 30 to 80 (mostly 40 to 60 μ) by 1·5 to 3·5 μ. On cornmeal sporulation occurs in cool autumn or winter weather, the conidia produced under these conditions being markedly obclavate, blunt or sometimes pointed at the apex, with sharply constricted, doliform cells, measuring 20 to 45 by 1·5 to 3·5 μ.

FOËX (E.) & ROSELLA (E.). **Quelques observations sur le piétin du Blé.** [Some observations on foot rot of Wheat.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 133–142, 1931.

Artificial infection experiments with wheat seedlings grown both under glass and in the field indicated that the undetermined or 'x' fungus associated with eye spot [*R.A.M.*, x, p. 512] attacks wheat at lower temperatures than does *Ophiobolus graminis*. In the winter of 1929–30, violent attacks of the 'x' fungus, attended with disastrous results, were of common occurrence in the vicinity of Paris, and in the following winter, which was a mild one, it was also very active. It appears that this is the organism responsible for most of the really serious cases of foot rot seen during the past few years in Seine-et-Oise and Eure-et-Loir. As a rule the 'x' fungus first attacks the extremity of the coleoptile, then passes to the sheaths beneath, and finally becomes established on the stem. Infection was noted on plants showing only one open leaf. All the evidence indicated that the spores of the fungus are air-borne. Further confirmation was obtained of the view that there exists a close relationship between the 'x' fungus and *Cercosporella*

herpotrichoides, and in a communication to the authors Dr. Sprague, of the Oregon Agricultural College, stated that he had succeeded in obtaining the conidia of *C. herpotrichoides* from a pure culture of the 'x' fungus [see preceding abstract].

TU (C.). **Physiologic specialization in Fusarium spp. causing headblight of small grains.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 74, 27 pp., 3 figs., 2 graphs, 1930. [Received August, 1931.]

The results of inoculation experiments [details of which are given] in 1927 and 1928 at University Farm, St. Paul, Minnesota, with strains of *Fusarium* isolated from blighted heads of cereals [*R.A.M.*, viii, p. 497], indicated the existence of three physiological forms of *Fusarium graminearum* (*Gibberella saubinetii*), two obtained from wheat and one from oats, three of *F. culmorum*, all from wheat, and two of *F. avenaceum*, one from wheat and one obtained through Sherbakoff, which can be differentiated by the varying reactions caused by them on different varieties of their respective hosts. Further studies in which, besides these species, *F. solani* and *F. nivale* (*Calonectria graminicola*) from Sherbakoff and Wollenweber, respectively, were included, showed that there also are differences in pathogenicity in these five species, as well as in their temperature relations. The optimum temperature for growth in pure culture of *F. avenaceum* form 2 (from Sherbakoff), the three forms of *G. saubinetii*, and the three forms of *F. culmorum* (and also of the mutant of the latter which appeared in a culture and differed from the parent both morphologically and in pathogenesis) is about 27° C., that for *F. avenaceum* form 1 and *C. graminicola* about 22°, and that for *F. solani* about 32°. The physiological forms of *G. saubinetii*, *F. culmorum*, and *F. avenaceum* differ also in their capacity for alcoholic fermentation.

Circumstantial and experimental evidence is adduced, indicating that the initial infection of the cereal ears with these fungi probably occurs through the glumes rather than through the anthers.

SMITH (D. C.) & BRESSMAN (E. N.). **Susceptibility of Markton and other varieties of Oats to covered smut (Ustilago levis).** —*Journ. Amer. Soc. Agron.*, xxiii, 6, pp. 465–468, 1931.

The results of trials conducted at Corvallis, Oregon, in 1929 and 1930 to test the resistance of Markton and other oat varieties to covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, x, p. 449] are tabulated and discussed.

Three smut collections were made in 1928 from fields with up to 65 per cent. infection. Markton seed was hulled and three lots of the seed were heavily coated with a constant amount of spores from each of these collections, respectively, three weeks before planting, the grain being sown on 24th April, 1929. On 19th June the plants in half of each row were cut back with scissors to retard growth. All the smut observed in 1929 was found in the cut halves of the rows, indicating that the resistance of the plants was lowered so that the fungus was enabled to keep pace with their growth. The incidence of infection amounted to 1·7, 6·4, and 10·3

per cent., respectively, in the different collections. In 1930 the corresponding figures were 9·1, 21·5, and 22·5 per cent., respectively.

In 1930 the Markton, Black Mesdag, Eclipse, and Victory varieties were inoculated with seven different smut collections from the 1929 crop, a comparison being made between the incidence of infection on hulled and unhulled seed. On an average of all the varieties used in the test there was a 367 per cent. increase of infection from the use of hulled seed, the increase being highest in the case of Black Mesdag and lowest in that of Eclipse. Hulling reduced the total number of heads produced in the four varieties by 56 per cent. Eclipse, a large white variety of local origin, showed the highest average incidence of smut (23 per cent. hulled and unhulled), the corresponding figures for Victory, Markton, and Mesdag being 17, 12, and 1 per cent., respectively. The reputedly immune Markton variety is, therefore, susceptible to certain collections of *U. kolleri*.

KOLK (LAURA A.). **Relation of host and pathogen in the Oat smut, Ustilago avenae.**—*Bull. Torrey Bot. Club*, lvii, 7, pp. 443–507, 4 pl., 21 figs., 1930. [Received July, 1931.]

After a comprehensive review of the existing literature on seedling and flower infection by smut fungi, with particular reference to loose smut of oats (*Ustilago avenae*) [*R.A.M.*, vii, p. 503], the author describes at length the results of her experiments in the study of this process in the latter organism. The dry spore-dusting method of inoculation of oat seed-grain after dehulling used by her is claimed to have given 100 per cent. infection under the conditions of her work. In one- to four-days-old seedlings raised from inoculated seed, mycelium of the pathogen was found in the coleoptile from its tip to the coleoptile node, in the space between the first leaf and the coleoptile, in the tissues of the node, and in the mesocotyl in the vicinity of the coleoptile node. In a seedling three days old the germ-tubes were seen penetrating the epidermis of the coleoptile through the characteristic holes in the cuticle noted already by Brefeld, and in one case a chlamydospore outside the cuticle was found still attached to the penetrating germ-tube. In five- to eight-days-old seedlings the mycelium was distributed through the tissues of the coleoptile and mesocotyl, and in still older seedlings (13 to 30 days) it was present in the closely crowded nodes of the growing region from the coleoptile node up to the cone of the growing point, becoming sparser as it approached the point of origin of the youngest leaf primordium; in seedlings over one month old, it was found in the apex of the cone of the growing point.

The mycelium was abundant intracellularly in all the infected tissues of the coleoptile, mesocotyl, coleoptile node, and of the internode between this and the first leaf, but intercellular mycelium was also present. The hyphae are frequently long, and show signs of degeneration, but as they advance through the growing region they become shorter and appear to be both intra- and intercellular, while in the tip of the growing point the mycelium is only intercellular, and is composed of short, curiously curved segments.

There is a characteristic widening of the hyphae at the point where a host cell wall is penetrated. Some portions of the hyphae appear to be uninucleate, others binucleate or even multinucleate; the germ-tubes also may be uni- or binucleate. No evidence of conjugate nuclear division was obtained.

A preliminary study of Black Mesdag oats, resistant to loose smut, showed the mycelium to be usually present in the cells of the inner epidermis of the coleoptile, and only very rarely anywhere else in the coleoptile.

An important bibliography of over 150 titles is appended.

IMMER (F. R.) & CHRISTENSEN (J. J.). **Further studies on reaction of Corn to smut and effect of smut on yield.**—*Phytopath.*, xxi, 6, pp. 661–674, 1931.

Continuing their studies on the reaction of maize to smut (*Ustilago zeae*) and the effect of this disease on the yield of the crop [*R.A.M.*, vii, pp. 779, 780], the writers made an investigation, at St. Paul, Minnesota, of the losses caused by the fungus in F_1 crosses and in selfed lines of maize inbred for five or more generations.

The size of the galls and their position on the plant were found to be important. The larger the galls on the stalks, the greater was the reduction in the yield of shelled maize. Large or medium-sized galls on the stalk above the ears caused greater damage than those of comparable size below this point. It was found that susceptible lines of maize tended to have a greater number of galls of larger dimensions than resistant ones. It was estimated from available data that the reductions in yield in shelled maize resulting from large (4 in. in at least one diameter), medium, and small (less than 2 in. in any diameter) galls on the stalks were 50, 25, and 10 per cent., respectively.

Fifteen lines of maize inbred for at least eight years reacted in a very similar manner in each of six different years when grown in an epiphytotic of smut at University Farm. In 1928 and 1929 the extent of infection of numerous lines grown in the field in which only smut collections from the farm were used was correlated with that obtained in a different field where the inoculum was procured from various localities in the northern Mississippi Valley. The calculated correlation coefficients were $0{\cdot}47 \pm 0{\cdot}03$ and $0{\cdot}75 \pm 0{\cdot}02$, respectively.

In a study of the smut reaction of 34 F_1 crosses compared with that of the parents it was found that hybrids between two resistant lines were fairly resistant, though more severely infected than the parents. A composite cross was made of seven low-smut lines (0 to 15 per cent. infection) and one medium-smut line (15 to 50 per cent.). A large number of the resulting F_2 plants were selected at random and selfed to provide a large F_3 population. The reaction of the 299 F_3 lines thus obtained was of considerable interest, 74 per cent. showing less than 20 per cent. smut, 87 per cent. less than 30 per cent. smut, 95 per cent. less than 40 per cent. It is evident, therefore, that composite crosses will yield smut-resistant lines in a high proportion of cases.

McINDOE (K. G.). **The inheritance of the reaction of Maize to Gibberella saubinetii.**—*Phytopath.*, xxi, 6, pp. 615–639, 1 fig., 6 graphs, 1931.

The parental strains of maize employed in the writer's investigations on the inheritance of reaction to the root rot caused by *Gibberella saubinetii* in Minnesota [cf. *R.A.M.*, ix, p. 299] consisted of 27 selfed lines, viz., 9 of Minnesota 13, 10 of Rustler, and 8 of Northwestern Dent. During the winter of 1929–30 there were available, in addition to the foregoing, 105 F_1 crosses and certain F_3 lines obtained by growing the F_2 generation in the field and self-pollinating plants at random. The five crosses from which the F_3 lines originated were Minn. 13 43 × 46 (resistant × susceptible), Minn. 13 43 × 47 (resistant × susceptible), Minn. 13 49 × 50 (susceptible × intermediate), Rustler 58 × 60 (susceptible × susceptible), and N. W. Dent 64 × 66 (intermediate × susceptible). The single physiologic form of *G. saubinetii* used throughout the study was originally obtained from Wisconsin, being that designated by Tu as *Fusarium graminearum* form 1 [ibid., viii, p. 497 and above, p. 721]. By means of radiators equipped with blowers automatically regulated by thermostats, the air temperature in the experimental greenhouse was maintained at about 20° and that of the soil about 15° C., special attention being paid to the equal distribution of temperature through the house. The maize seed-grain was inoculated by a few seconds' immersion in a pure culture of *G. saubinetii* suspended in tap water, a corresponding number being dipped in 0·02 per cent. semesan for control purposes.

The results of the hybridization experiments [which are tabulated and discussed] were conflicting in the F_1 generation, the progeny of crosses between resistant and susceptible parents sometimes being highly resistant and in other cases quite susceptible. Occasionally resistant hybrids were produced by parents possessing an intermediate degree of resistance, but in no case did very resistant progeny spring from parents of extreme susceptibility, although such crosses sometimes showed moderate resistance. It cannot be definitely stated that resistance is either dominant or recessive to susceptibility, a more logical assumption being that the inheritance is quantitative in nature and conditioned by multiple factors. Further evidence in support of this view was afforded by an examination of the F_3 progeny of five selected crosses. A definite distribution of the degree of resistance in the F_3 lines occurred in conformity with the hypothesis that there was Mendelian segregation of quantitative factors. Where the reaction of the parental lines was widely divergent, highly resistant and susceptible lines arose in the F_3 in sufficient proportion to justify the tentative suggestion that relatively few factors may be involved in the production of intrinsic resistance. In F_3 lines obtained from parents differing widely in resistance, a definite and significant correlation was found to exist between seedling vigour and resistance, but none could be detected between seedling reaction in the greenhouse and yield in the field as affected by fungous invasion of mature plants.

SĂVULESCU (T.) & RAYSS (T.). **Une nouvelle maladie du Maïs en Roumanie provoquée par Nigrospora oryzae (B. et Br.) Petch.** [A new disease of Maize in Rumania caused by *Nigrospora oryzae* (B. et Br.) Petch.]—*Arch. Roumaines Path. Expér. et Microbiol.*, iii, 1, pp. 41–53, 1 pl., 10 figs., 1 graph, 1930.

In this account of the symptoms and causal organism of a greyish-black rot of the rachids of maize (*Zea mays* var. *dentiformis*) growing in the vicinity of Bucharest, the authors state that they observed the presence in diseased material of a fungus, the black, subspherical or oval spores of which were unicellular, single, had a thin membrane, and measured 9 to 16 μ (generally 13 to 15 μ) by 9 to 15 μ (generally 11 to 13 μ), their average dimensions being 13·5 by 12 μ. They were borne on the ends of small terminal branches or on short lateral conidiophores. Small ovoid conidia developed in a culture in a 2 per cent. glucose solution kept in a damp chamber.

The fungus was identified as *Nigrospora oryzae* [*R.A.M.*, x, p. 77; see also vi, p. 758], the synonymy, systematic position, and geographical distribution of which are discussed. *Coniosporium gečevi* Saccardo non Bubák was found, from an examination of Arzberger's specimens, to have spores measuring 13 to 15 μ in longest diameter, and is, therefore, properly referable to *N. oryzae*. The spores of *C. gečevi* Bubák measure 18 to 20 μ in long diameter, and this fungus is referable to *N. sphaerica*.

SWANSON (A. F.) & PARKER (J. H.). **Inheritance of smut resistance and juiciness of stalk in the Sorghum cross, Red Amber × Feterita.**—*Journ. of Heredity*, xxii, 2, pp. 51–56, 3 figs., 1931.

The mode of inheritance of reaction to covered kernel smut of sorghum (*Sphacelotheca sorghi*) in the cross, Red Amber (susceptible) × feterita (immune) was determined at Hays, Kansas, the seeds from 284 F_2 heads being inoculated in 1920 with spores of physiologic form 1 of the fungus [*R.A.M.*, ix, p. 375] and sown in separate rows. Any row in which any plant in the F_3 showed smut was classed as susceptible, and there were 211 such rows against 73 with no trace of smut. Observations were continued to the F_8 generation, and the data [which are tabulated] are stated to be satisfactorily explicable on the basis of a single factor difference. Susceptibility appears to be dominant to resistance and dry stalks to juicy stalks, but there was no conclusive evidence of genetic linkage between these characters, though a slight tendency towards greater susceptibility in the plants with juicy stalks was observed.

PETRI (L.). **Nuove osservazioni sulla biologia della 'Deuterophoma tracheiphila'.** [New observations on the biology of *Deuterophoma tracheiphila*.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 4, pp. 437–447, 4 figs., 1931.

In this account of preliminary investigations conducted to ascertain how citrus leaves become infected by *Deuterophoma tracheiphila* [*R.A.M.*, x, p. 593] the author points out that as the

pycnospores are usually released only when the pycnidia are thoroughly wet [ibid., x, p. 182] the spores cannot be wind-borne; under dry conditions they adhere tightly to the walls of the pycnidia, but the pycnidia themselves are readily dislodged from diseased branches and their small size would easily permit wind-dissemination. Infection of the upper surfaces of the leaves presumably takes place through the stomata along the midrib, the only part of the upper surface in which these organs are found in the lemon and orange. This part of the leaf collects droplets of water in wet weather and pycnidia falling into them would readily emit their spores. The stomata along the midrib lead to very wide intercellular passages in the underlying chlorenchyma, parenchyma round the vascular bundles, and in the bundles themselves.

Laboratory experiments demonstrated that a saturated atmosphere can also bring about a partial emission of spores and their germination on the leaf surface. For infection to take place at 15° to 16° C. either free water or a saturated atmosphere would have to persist for about 40 hours. Spores in the immediate vicinity of a stomatic aperture are favoured in causing infection by the aqueous vapour emitted from the stomata and, possibly, by the carbon dioxide liberated by the host during the night [ibid., vi, p. 413].

Another part of the leaf where infection is likely to take place is the tip, where, especially in the bitter orange [*Citrus bigaradia*] leaf, the two vascular bundles terminate; they have thick, short tracheids near the stomata, which in the under surface of this area are very numerous. Here rain or dewdrops collect and would induce the emission of the pycnospores.

Pycnospores in water containing 1 per cent. glucose swell noticeably, and produce from one end a germ-tube which is wide when compared with the mature pycnospore. If, however, the pycnospore is allowed to germinate in a drop of water on the leaf of a lemon or bitter orange it does not swell so much, and the resultant hyphae are very thin (0·3 to 0·4 μ). Germination in this case may take place at both poles and also laterally. By the fourth day, some of the germ-tubes have reached 130 μ or more in length, though others remain very short. Anastomoses between neighbouring germ-tubes are not uncommon.

In very young leaves, which have few stomata along the midrib, infection of the upper surface would appear to take place only with difficulty. In adult leaves, the stomatic cells in the upper surface have a very thick cell wall which often completely and permanently closes the aperture. Hence leaves which have not quite reached their full growth are probably those most likely to be infected.

Attention is directed to the influence exerted by different hosts, in all probability by the secretions of the leaf tissue, upon the germination of the pycnospores. Preliminary tests showed that whereas in the pycnospores of *D. tracheiphila* placed in water on leaves of bitter orange germination occurred after 48 hours, on mandarin leaves it was delayed and a smaller percentage of the spores germinated.

BRIEN (R. M.). **Pathogenicity of the bark-blotch organism. Experimental work on Lemon trees.**—*New Zealand Journ. of Agric.*, xlii, 5, pp. 341–347, 6 figs., 1931.

This is a brief account of the author's inoculation experiments with the bark-blotch organism (*Ascochyta corticola*) of lemon trees in New Zealand [*R.A.M.*, i, p. 291; v, p. 213]. Since its first record from that island in 1921, the disease apparently remained confined to three localities near Auckland City until 1930, when it was found causing severe damage in the lemon groves of the Tauranga district and also on one-year-old lemon trees in an orchard in the Gisborne district. The experiments (in which two-year-old trees of the varieties Lisbon and Eureka on sweet orange stocks were used) showed that under favourable conditions *A. corticola* is a definite wound parasite on the stems, branches, leaves, and fruits of the lemon. On the stems and branches the lesions appeared in from three weeks to two months, and on the fruits and leaves in from 12 to 15 days. On leaves kept under moist conditions pycnidia were produced abundantly; on fruits under similar conditions the lesions spread rapidly, finally extending over the whole surface. On the woody organs the first sign of successful infection was the development of a dark brown zone around the point of inoculation; this zone gradually extended until the stem or branch was girdled and all the portions above it were killed. At the same time infection progressed downwards, gradually encircling and killing the lower branches. Gumming is usual but does not occur until two or three weeks after infection. On the cankers resulting from inoculations penetrating the cortex of the branch greyish-white patches appeared in four to six months, bearing numerous black pycnidia. The cankers appeared to be formed to a lesser extent on the Lisbon than on the Eureka variety. In every case the causal organism was recovered from the lesions. On sweet orange stocks only one inoculation proved successful, this being the only record of *A. corticola* on this host from New Zealand.

In giving an emended description of the fungus from inoculations on lemon leaves, it is stated that the pycnidia are erumpent, depressed-globose to lenticular, dark brown to black in transmitted light, with a papillate ostiole, and measure 300 to 375 μ in diameter. The spores are hyaline, two-celled, elliptical, frequently allantoid, smooth, and 7 to 9 by 2 to 3 μ (average 7·7 by 2·8 μ). The conidiophores are simple, continuous, cylindrical, and 12 to 14 by 3 to 3·5 μ in diameter.

Complete control of the disease in the Tauranga district in 1930 was obtained by the removal of infected tissues around cankers and the disinfection of the resulting lesions with a solution of acidulated mercuric chloride; the application of Bordeaux paste to the wounds also gave good results in Gisborne.

RHOADS (A. S.). **Gummosis and psorosis of Citrus trees.**—*Florida Agric. Exper. Stat. Press Bull.* 431, 2 pp., 1931.

The main purpose of this popular bulletin is to point out the chief features which differentiate gummosis [*R.A.M.*, ix, p. 159; x, p. 226] from psorosis [Florida scaly bark: ibid., v, p. 717; vi,

p. 401] of citrus trees, since growers in Florida frequently confuse the two. While gummosis appears at first as small longitudinal cracks in the bark of the trunks and larger branches, accompanied by a copious exudation of gum, psorosis usually begins with the loosening and scaling off of a number of small pieces of the outer bark, or as an inconspicuous spot in which the bark becomes infiltrated with gum and dies, the outer bark well in advance of this area, later cracking and scaling off; exudation of gum is not copious, usually being reduced to a few scattered drops on either side of the lesion. In further distinction from gummosis, psorosis exhibits a definite tendency to encircle the attacked trunk or branch, and its lesions often occur on the smaller branches as well as on the trunks and main limbs, whereas the most common and typical form of gummosis is largely confined to the trunks and larger branches.

RHOADS (A. S.). **Treatment of gummosis and psorosis of Citrus trees.**—*Florida Agric. Exper. Stat. Press Bull.* 432, 2 pp., 1931.

Briefly summarized, the treatment of the Florida forms of gummosis and psorosis of citrus trees [see preceding abstract] recommended in this paper consists, first, in the thorough removal from the affected trees of all dead branches and of those that are badly weakened by the disease, followed by the cutting out of all gum masses and the removal of all loose, scaling bark. The outermost layer of diseased bark should then be carefully scraped off with a sharp implement [some types of which are briefly indicated]; the scraping should be just deep enough to remove almost all the green layer immediately underlying the dark corky tissue, and should never extend deeper than a third of the total thickness of the bark, so as not to injure the cambium. Any considerable area of bark that is dead down to the wood or has been loosened by gum formation beneath it, should be cut out back to the margin of the callus tissue developing under or around it. All the resulting lesions should be painted with a disinfectant paste or wash, among which lime-sulphur or other compounds of lime and sulphur appear to be the most effective both as fungicides and in promoting the bark scaling process. All the trees so treated should be inspected at intervals of a few months, especially during late spring and early autumn, when the diseases develop most rapidly, and all freshly developed lesions should be treated in the same way. The importance of scraping off the bark well in advance of the margins of the lesions and of the follow-up treatments, cannot be too strongly emphasized.

BENTON (R. J.). **Prevention of decay in Oranges.**—*Agric. Gaz. New South Wales*, xlii, 5, pp. 411–413, 1931.

The author states that large-scale comparative experiments in 1930–1 showed that dipping oranges in an 8 per cent. borax solution before covering them with liquid paraffin was more effective in preventing the development of decay (chiefly that caused by species of *Penicillium*) in cold storage than dipping the oranges in a 3 per cent. sodium bicarbonate solution [cf. *R.A.M.*, x,

p. 451]. The wastage due to decay was 3·35 and 2·06 times greater in untreated fruit than in that treated with borax and sodium bicarbonate, respectively.

BALLY (W.). **Handboek voor de Koffiecultuur. Eerste Deel: de ziekten van de Koffie.** [Handbook for Coffee cultivation. Part I: the diseases of Coffee.]—212 pp., 14 col. pl., 98 figs., Amsterdam, J. H. De Bussy, 1931.

In a foreword to this book the author states that he has long felt the need of a treatise on the phytopathological aspects of coffee cultivation calculated to be of service both to planters and to scientists. The present work is the outcome of ten years' activity at the Salatiga and Malang Experiment Stations, Java, of visits to the chief coffee-planting centres of the Dutch East Indies, and of a study of the relevant literature, both Dutch and foreign, on the fungous and non-parasitic diseases of this important crop. In breadth of treatment as well as in the detailed discussion of the scientific and practical aspects of the various diseases, the work forms a very complete and valuable treatise on the pathology of the coffee plant.

The book opens with a short historical survey of coffee cultivation, with special reference to the Dutch East Indies, where scientific interest in the crop was first awakened in 1885 by the increasing depredations of the leaf disease (*Hemileia vastatrix*), leading to the replacement of the susceptible *Coffea arabica* by the resistant *C. robusta*. This interest has since been maintained and consolidated by the establishment of experiment stations at which the pests and diseases of coffee are studied. From 1911, when the Malang station was opened, until 1926 the main object of investigation was the coffee berry borer (*Stephanoderes hampei*), but during the past five years the ravages of top die-back [*R.A.M.*, x, p. 518] have brought the problems of disease to the foreground.

Some general observations are made on the economic importance of coffee diseases and on the work awaiting phytopathologists both in an advisory and in a practical capacity. Other chapters of a general character deal with the definition of plant disease and its action on the physiological functions of the plant; the agents, symptoms, and classification of diseases; the influence of environmental conditions, degeneration, and resistance; preventive and curative measures; and literature.

The diseases are discussed under the following headings: root diseases, stem and branch diseases, leaf diseases, seed-bed diseases, and diseases and abnormalities of flowers, fruits, and seeds. A high standard of excellence is reached by the coloured plates and photographs illustrating a large number of the diseases, as also by the drawings of the microscopic characters.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Cotton root rot and its control.**—*Texas Agric. Exper. Stat. Bull.* 423, 39 pp., 7 figs., 1 map, 1931.

In this bulletin a summary is given of the information so far accumulated in the study in the United States of cotton root rot

(*Phymatotrichum omnivorum*), most of which has been noticed in this *Review* [*R.A.M.*, x, p. 454, *et passim*].

OTA (M.). **Revue critique. Epidermophyton-Epidermidophyton.** [Critical review. *Epidermophyton-Epidermidophyton.*]—*Ann. de Parasitol. Humaine et Comp.*, ix, 3, pp. 277–281, 1 fig., 1931.

In this brief critical note the author points out that the fungus described by Lang as *Epidermidophyton* and by subsequent authors as *Epidermophyton*, was earlier described and figured by Harz as *Acrothecium floccosum*, and was transferred in 1873 by Berlese and Voglino to the genus *Blastotrichum* as *B. floccosum* (Harz) B. & V., which latter is considered to be the correct name. Whether the other species which have since been referred to *Epidermophyton* are related to this is doubtful, as some of these species that have been examined by the author have been found to belong to other well-known genera: thus, for instance, the species described in 1925 by MacCarthy as *E. plurizoniforme*, *E. lanoroseum*, and *E. gypseum*, are identical in his opinion, with *Sabouraudites ruber* [*Trichophyton rubrum*], *T. rubidum* (which is only a variety of the last-named), and *S. interdigitalis* [*T. mentagrophytes*: *R.A.M.*, x, p. 243].

EMMONS (C. W.). **Observations on Achorion gypseum.**—*Mycologia*, xxiii, 2, pp. 87–95, 2 pl., 1 fig., 1931.

Cultural studies [which are described] of *Achorion gypseum* [*R.A.M.*, vii, p. 169; viii, p. 780; x, p. 243] demonstrated that the small single-celled conidia and large pluriseptate macroconidia can each be derived from single spore cultures of either spore form. The cultural characters of the colonies derived from both types of spore also are identical, and both undergo the pleomorphic changes at about the same age. The hyphal cells and the macroconidia are multinucleate, and the small conidia have one or sometimes two nuclei. Spirals like those characteristic of *Trichophyton asteroides* [*T. mentagrophytes*: ibid., x, 243] were sometimes produced when the fungus was grown on nail parings; it grew well on these, and also on horn, destroying both substances.

WERTHER. **Über die Dresdner Epidemie von Mikrosporie und Alopecia parvimaculata und Deutung der letzteren als Mikrosporid.** [On the Dresden epidemic of microsporosis and alopecia parvimaculata and interpretation of the latter as microsporid.]—*Arch. für Dermatol.*, clxiii, 2, pp. 402–419, 6 figs., 1931.

During the period from 1928–31 an epidemic of microsporosis and alopecia parvimaculata occurred among children of 3 to 14 years old in Dresden, the causal organism being *Microsporon audouini*. Both diseases developed simultaneously and disappeared at the same time. The alopecia parvimaculata is regarded as a secondary manifestation of the microsporosis (microsporid).

TALICE (R. V.) & MACKINNON (J. E.). **Sabouraudites (Microsporum) parasites de l'homme en Uruguay.** [*Sabouraudites (Microsporum)* parasitic on man in Uruguay.]—*Comptes rendus Soc. de Biol.*, cvii, 21, pp. 883–884, 1931.

The authors have studied 70 cases of dermatomycosis in Uruguay from a mycological standpoint. The causal organisms isolated were *Sabouraudites felineus* (20 strains), *S. gypseus* (2), and *S. equinus* (1) [*R.A.M.*, x, p. 243]. *S. lanosus* is believed to be only a variant of *S. felineus*. It is stated to be apparent from this investigation that all the species of *Sabouraudites* occurring in Uruguay are of animal origin.

FLOOD (C. A.). **Observations on sensitivity to dust fungi in patients with asthma.**—*Journ. Amer. Med. Assoc.*, xcvi, 25, pp. 2094–2096, 1 fig., 1931.

In a group of 55 patients suffering from chronic asthma, 8 (14 per cent.) gave positive skin reactions to common air-borne fungi (one each to *Aspergillus niger*, *Hormodendrum hordei*, *Penicillium roseo-griseum*, *P. aurantio-violaceum*, *Paecilomyces variotii*, and *Trichothecium roseum*, and two to *Mucor plumbeus*), all the strains being isolated from the dust of rooms occupied by persons with asthma or eczema [cf. *R.A.M.*, ix, p. 384]. Typical asthmatic attacks were induced in one of these patients, a 39-year-old West Indian negress, by spraying the nose and throat with a filtrate of *M. plumbeus*.

DIDDENS (HARMANNA A.). **Onderzoekingen over den Vlasbrand, veroorzaakt door Pythium megalacanthum de Bary.** [Investigations on Flax scorch caused by *Pythium megalacanthum* de Bary.]—*Thesis, Univ. of Amsterdam*, 127 pp., 3 pl., 2 graphs, Baarn, Hollandia-Drukkerij, 1931. [English summary.]

The presence of *Pythium megalacanthum* [*R.A.M.*, vii, p. 578] was detected in the decayed roots of 32 samples of flax suffering from 'scorch' in the provinces of Groningen, Friesland, and Zeeland (Holland), and south-west Flanders (Belgium) during the years 1928–30. *Asterocystis radicis* [ibid., x, p. 14], *Thielavia basicola*, and various Phycomycetes (probably *Pythium* spp.) were also found in smaller numbers in the diseased roots.

Notes are given on the flax diseases caused by *Colletotrichum linicolum* [*C. lini*: ibid., ix, p. 665] and *Ascochyta linicola* [ibid., ix, p. 112], as well as on flax 'sickness' [ibid., x, p. 108], with which scorch may be confused.

Inoculation experiments were carried out on flax plants in water cultures to which was added a spoonful of infested soil. The decayed roots were constantly found to contain a Phycomycete (*P. megalacanthum* or another species of *Pythium* or *Phytophthora*), mostly accompanied by numerous hypnospores of *A. radicis*, but the typical symptoms of scorch often failed to appear in the water cultures. In all cases where pot cultures were used, however, the scorch symptoms developed where *Pythium megalacanthum* was present. Inoculation experiments with pure cultures of the latter

on flax plants in water and pot cultures resulted in severe rotting of the root system commencing in $1\frac{1}{2}$ to 2 days and extending to most of the roots, the green parts showing symptoms of scorch in the pot cultures in about 3 days when recent isolations of the fungus were used but not until 20 days with isolations over a year old. *P. de Baryanum* and *P. irregulare* [ibid., viii, p. 187] also caused severe infection on plants in water cultures, while *P. de Baryanum* var. *pelargonii*, *P. intermedium*, and *P. splendens* [loc. cit.] were responsible for milder symptoms. In pot culture inoculations, *P. de Baryanum* and *P. irregulare* produced quite different symptoms from the scorch caused by *P. megalacanthum*, being more reminiscent of damping-off. *P. aphanidermatum*, *P. butleri*, *P. complectens*, *Aphanomyces euteiches*, and *Asterocystis radicis* caused little or no decay of the roots, and the symptoms induced by *T. basicola* were negligible. It is evident, therefore, that *P. megalacanthum* is the organism responsible for flax scorch.

Certain differences were observed between the writer's isolations of *P. megalacanthum* and the description of the type species. Thus, the oogonia of the former measure 30 to 70 μ (majority 45 μ, mean 55 to 60 μ) compared with 36 to 45 μ in the latter, the corresponding measurements for the spines and the oospores being up to 12 μ long and up to 53 μ in diameter, respectively, in the Dutch material as compared with 6 to 9 μ and 27 μ given for the type species. These discrepancies, however, are not considered to warrant the establishment of a new species, particularly as it was impossible to obtain zoospore formation by the flax fungus.

Inoculation experiments with *P. megalacanthum* or infested soil in water cultures with v. d. Crone's or Olsen's solutions at varying hydrogen-ion concentrations showed that severe infection occurred at P_H 6, 7, 8, and 9, the optimum being from P_H 7 to 8. Below P_H 6 infection decreased and at P_H 5 there was practically no root rot.

The results of experiments in which nitrogen, potash, calcium, phosphates, and sodium were added to inoculated water and pot cultures in various combinations and amounts showed that the first-named, especially in the form of Chilean nitrate of soda, is apt to aggravate the flax scorch. The use of calcium carbonate was also found to promote the development of the disease, whereas that of calcium sulphate exerted a preventive action. Applications of basic slag caused more serious outbreaks of scorch than did those of superphosphate. It is apparent that the use of fertilizers tending to produce an alkaline reaction in the soil is liable to increase the incidence of flax scorch. No beneficial effects were derived from the application of copper sulphate to the water or pot cultures, but old cow dung was found to cause a very marked decline of infection.

No symptoms developed on 37-day-old flax plants inoculated in water cultures, the disease being confined to very young seedlings (under 28 days). At 10° C. flax seedlings make very slow growth and root rot is somewhat retarded compared with the rate of infection at a favourable temperature for their development (18° to 20°).

Inoculation experiments with *P. megalacanthum* on peas,

parsley, sugar beet, mangold, and cress (*Lepidium sativum*) gave negative results.

A six-page bibliography is appended.

Atkins (W. R. G.). **The deterioration of fabrics exposed on a roof after treatment with fishing-net preservatives.**—*Journ. Marine Biol. Assoc.*, N.S., xviii, 2, pp. 473–477, 1931.

In connexion with investigations on the deterioration of linen and cotton fabrics exposed for two years on a roof at Plymouth after treatment with fishing-net preservatives, attention is again drawn to the excellence of cuprinol, a copper soap of a petroleum acid [*R.A.M.*, ix, p. 526], as a protective against bacteria and moulds. The weakening of the fabrics, which lost one- to two-thirds of their initial strengths both in warp and weft, is attributed principally to the action of light.

Grieve (B. J.). **'Rose wilt' and 'dieback'. A virus disease of Roses occurring in Australia.**—*Australian Journ. Exper. Biol. & Med. Sci.*, viii, 2, pp. 107–121, 6 figs., 1931.

An account is given of a virus disease known as 'wilt' or 'die-back' which is stated to be very prevalent among roses in Victoria and other parts of Australia. The disease is serious and appears likely to become a limiting factor in rose-growing in Victoria. It generally occurs in epidemic waves, causing heavy damage for a season, subsequently losing its virulence for a time, and then regaining it.

The first noticeable symptom is a peculiar recurved appearance of the leaves on young shoots, the leaflets of which sometimes also seem to be crowded together on the petiole, and are very brittle. Defoliation begins at the tips of the stems of affected plants and works downwards, the leaves sometimes turning pale green or yellowish before dropping. About a day later the tips of the young stems begin to discolour and die back for a distance of one to two inches. The rest of the young stem then develops a characteristic translucent, yellowish-green appearance, the base turning brownish-black within a few hours. Young leaf buds in the basal browned area remain green for some time. Gradually the whole stem becomes discoloured and dies back, the developing leaf buds turning brown at the tips and rotting away. In many cases the plant sends up one or more watershoots after the stems have died back, but they soon become diseased. Temporary recovery may occur but finally the plants wither.

Various organisms were isolated from the diseased twigs, but inoculation experiments with them on healthy plants gave negative results in every case. On examination of the diseased tissues, fungi and bacteria were found to be present only in the 'die-back' stage of the disease and not in the 'wilt', a fact which, taken in conjunction with the negative results of the inoculation tests, suggested an ultra-microscopic agent of the condition. An infectious principle was found to be present in the expressed juice of diseased roses and shown to be capable of passing through a Seitz filter. The disease was transmitted from infected to healthy rose plants by the inoculation of the latter with filtered juice through scratched and pricked leaves and petioles.

GLOYER (W. O.). **China Aster seed treatment and storage.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 177, 3 figs., 2 graphs, 1931.

A full description, supplemented by 13 tables, is given of the writer's experiments in the control of the following seed-borne parasitic fungi on Chinese asters (*Callistephus chinensis*) at Geneva, New York: *Septoria callistephi* [*R.A.M.*, x, p. 461], *Ascochyta asteris, Fusarium conglutinans* var. *callistephi* [ibid., x, p. 227], *Botrytis cinerea, Pleospora herbarum* [ibid., x, p. 430], and *Alternaria* spp. The best results were given by the following treatment. (1) Thirty minutes' presoaking of the seed in water heated to 100° F., followed by draining; (2) 30 minutes' immersion in mercuric chloride (1 to 1,000) at 100°, then draining; (3) 5 minutes' washing in cold running water, followed by draining; and (4) 24 hours' drying on a towel or fine cheese-cloth in an ordinary heated room. For work on a commercial scale, involving the treatment of large lots, a temperature of 90° was substituted for 100° in the two first processes in order to obviate premature germination before thorough drying. Temperatures below this point cannot be relied upon to destroy *S. callistephi* completely, and in such cases the application of a weak solution of Bordeaux mixture in the seed-bed would be necessary to supplement the seed treatment.

The above treatment has also been employed with satisfactory results in the control of *Septoria* [*apii*] on celery [loc. cit.].

KUNKEL (L. O.). **Studies on Aster yellows in some new host plants.**—*Contrib. Boyce Thompson Inst.*, iii, 1, pp. 85–123, 12 pl., 1931.

In continuation of his studies on the host range of aster yellows [*R.A.M.*, vii, p. 446] the author gives a list of 120 new species belonging to 30 different families [which are enumerated] to which the disease was experimentally transmitted (with the single exception of the tomato, which was infected by grafting with diseased buds of *Nicotiana rustica* [ibid., ix, p. 418]) by means of the leaf-hopper *Cicadula sexnotata*. In no case was the disease transmitted mechanically by means of juice from diseased tissues. A brief description is also given of the most striking symptoms on each host plant. Potato, tobacco, peach, celery, and *Zinnia elegans* were among the species to which the disease was not transmitted after repeated exposures to virus-bearing colonies of *C. sexnotata*, while the successful cases included many flowers cultivated for ornament, various vegetables such as carrot, parsnip, tomato, and New Zealand spinach (*Tetragonia expansa*), and a number of weeds. Approximately half the known hosts belong to the Compositae, but there is little evidence of any close correlation between susceptibility and systematic affinity since immune, resistant, and very susceptible plants may all be closely related species.

SCHWARTZ (G.). **Die Bekämpfung des Blattfalles bei Azaleen.** [The control of leaf fall in Azaleas.]—*Blumen- und Pflanzenbau*, xlvi, 6, pp. 89–91, 2 figs., 1931.

The leaf fall of azaleas due to *Septoria azaleae* [*R.A.M.*, x, p. 460] was found, as a result of the writer's experiments [which

are fully discussed] in nurseries at Pillnitz [Saxony], to be controllable by the following treatment. Plants kept during the winter in dry, well-lighted houses with adequate ventilation should be sprayed at four- to six-weekly intervals through the summer with 1 per cent. Bordeaux mixture. This preparation, however, should not be applied later than four months before the plants are marketed, as it leaves a whitish-blue coating on the foliage, but should be replaced by 0·5 per cent. vomasol C ('Voma' Chemisches Werk, G.m.b.H., Alfeld, Leine) [ibid., vii, p. 349]. Where the plants have to be kept over winter in frames or in poorly lighted houses, vomasol C should be employed in preference to Bordeaux mixture, which is liable to cause burning of the foliage under damp conditions.

Bégonias tubéreux attaqués par Rosellinia necatrix. [Tuberous Begonias attacked by *Rosellinia necatrix*.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 5, p. 168, 1931.

Begonia tubers layered out in sand in the autumn of 1930 in the vicinity of Paris were invaded both externally and internally by the mycelium of a fungus which was identified as *Rosellinia necatrix* [cf. *R.A.M.*, ix, p. 624]. The symptoms caused on begonias are not described except that the tubers were covered by the greyish-white mycelium, the brown superficial hyphae of which showed the dilatations characteristic of the fungus. It is believed that the infection was carried in the sand.

MATSUMOTO (T.) & OKABE (N.). **On the causal organisms of the bacterial soft rot of Kotyô-ran, Phalaenopsis aphrodite Reichb. f.**—*Journ. Soc. Trop. Agric.*, Formosa, iii, pp. 117–134, 1 pl., 3 graphs, 1931. [Japanese summary.]

Full details are given of studies conducted at Taihoku, Formosa, Japan, on a bacterial rot of the orchid *Phalaenopsis aphrodite* first observed in the summer of 1929.

The disease is characterized by water soaked, more or less sunken, brown spots on both leaf surfaces. In the later stages the affected areas become soft, slimy, and finally rotten. The causal organism is rod-shaped with rounded ends, 1 to 4·8 by 0·5 to 0·9 μ (usually 1·5 to 2·5 μ in length), occurring singly, in pairs, or in short chains, with 4 to 6 peritrichous flagella, 12 to 15 μ long. The cultural characters of the bacterium on a number of standard media are described. The best growth was made in nutrient broth and onion and potato decoctions at a slightly alkaline reaction. The optimum temperature for development was found to be 34° to 37° C., and the maximum and minimum 42° and 15°, respectively. The growth of the organism was reduced by 90 to 100 per cent. by ten minutes' exposure to sunlight through ordinary glass in May, 1931, the inhibitory action being accelerated by 5 to 10 per cent. when 'ultravit' glass was used. Ammonia and acids were produced, nitrate was reduced, and gelatine liquefied by the organism, which reacted negatively to Gram's stain.

Agglutination tests revealed a close relationship between the orchid bacterium and two organisms isolated from onion and *Amorphophallus konjac*, respectively (Nos. 403 and 207), and a

more distant connexion with 208 and 209 from *A. konjac* and 'pe-tsai' cabbage [*Brassica pekinensis*: cf. *R.A.M.*, x, p. 87]. It is further closely related to *Bacillus betivorus* [ibid., x, p. 575] and in some respects to *Bacterium cypripedii* Hori (*Centralbl. für Bakt.*, Ab. 2, xxxi, p. 85, 1912). The orchid bacterium, however, appears to be most nearly allied to *Bacillus carotovorus*, in spite of certain slight differences, and it is therefore proposed to name it *B. carotovorus* type B, using the designation type A for Jones's original species.

Inoculation experiments with *B. carotovorus* type B gave positive results on *Cypripedium insigne*, *Cymbidium aloifolium*, tomato (leaves and fruit), tobacco, onion, cabbage, cauliflower, kohlrabi [*Brassica oleracea* var. *caulo-rapa*], potato, and melon (*Cucumis melo* f. *albus*).

PUTTEMANS (A.). **Uma ferrugem nova em planta australiana cultivada no Brasil.** [A new rust on an Australian plant cultivated in Brazil.]—*Bol. Mus. Nac.*, Rio de Janeiro, vi, 4, pp. 312–314, 1 fig., 1930. [Received September, 1931.]

The leaves of *Melaleuca leucadendron* near Campinas, Brazil, were found, in July, 1930, to be attacked by a species of rust believed to be new to science and named *Puccinia camargoi* n. sp. [with Portuguese and Latin diagnoses]. It is characterized by amphigenous sori in small groups, round or oblong, 0·3 to 0·7 mm. in diameter; globose, subglobose, ellipsoid, or very rarely angular, verrucose, yellow to orange uredospores measuring 17 to 20 by 17 to 28 μ, with a subhyaline wall, about 2 μ thick; and light brown, ovoid, oblong to fusoid, or piriform, smooth teleutospores, 15 to 22 by 32 to 55 μ, with a rounded or tapering apex, constricted at the septum, wall 1 to 2 μ thick, the apex a little more, and with a short, subhyaline pedicel.

KOTTHOFF (P.). **Eine Kräuselkrankheit an Asparagus sprengeri.** [A curl disease of *Asparagus sprengeri*.]—*Blumen- und Pflanzenbau*, xlvi, 6, p. 94, 1931.

In this brief note (which originally appeared in *Landw. Zeit für Westfalen und Lippe*) the writer records the widespread occurrence in Münster nurseries of a disease of *Asparagus sprengeri* characterized by stunting of the fronds, abnormal shortness of the internodes and lateral branches, and a generally bushy and witches' broom-like appearance. The small, narrow leaves were often curled, and bore on their upper and under surfaces whitish, later yellowish-brown spots, sometimes extending the whole length of the midrib. Pure cultures of a fungus [which is not named] were obtained from the leaf tissues, but inoculations have not yet been carried out with it.

VIENNOT (G.). **Pseudoperonospora et Peronospora des Orties.** [*Pseudoperonospora* and *Peronospora* of Nettles.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 151–153, 1 pl., 1931.

In briefly describing the downy mildew of the nettles *Urtica urens* and *U. dioica* caused by *Pseudoperonospora urticae* and that caused on the former host by *Peronospora de Baryi* [*R.A.M.*,

viii, p. 508], the author states the latter fungus was observed by him in June, 1929, in two different localities near Grignon (Seine-et-Oise), in each of which it was very prevalent. *Pseudoperonospora urticae* is very common in France on *U. dioica* but less so on *U. urens*.

CHAMBERLAIN (G. C.). **Studies in fruit diseases. VI. Fire blight of Apples and Pears.**—*Canada Dept. of Agric. Pamphlet* 138, N.S., 10 pp., 3 pl., 1931.

Popular notes are given on the distribution, symptoms, mode of infection, and control of fireblight of apples and pears (*Bacillus amylovorus*) in Canada [*R.A.M.*, viii, p. 40]. The disease is stated to be most severe in Ontario and British Columbia, the two provinces responsible for the production of 90 per cent. of the pear crop. The most susceptible pear varieties are Bartlett, Flemish Beauty, Clapp's Favourite, and Duchess, while Kieffer, Seckel, Anjou, and Howell are more resistant. Among apples Talman Sweet, Alexander, Greening, Baldwin, Transparent, and Duchess are conspicuous for susceptibility, and in Quebec severe infection occurs on Fameuse and MacIntosh. Directions are given for the excision of cankers and the disinfection of the wounds with mercuric chloride.

SALMON (E. S.) & WARE (W. M.). **A new fact in the life-history of the Apple scab fungus.**—*Gard. Chron.*, lxxxix, 2319, pp. 437–438, 4 figs., 1931.

On 11th May, 1931, scab (*Venturia inaequalis*) spots were found on the leaves surrounding the blossoms of Worcester Pearmain apples, at Faversham, Kent, though no trace could be detected of the previous year's leaves on the ground or of the fungus in the young wood. Later the same variety was found to be similarly infected at Wye. The new leaves were so heavily attacked on the under surface, along the midrib or over the lamina, as to indicate an adjacent source of infection. Close inspection revealed scab pustules, bearing abundant conidia, on the lowermost bud scales, a part on which the fungus does not appear to have been previously recorded. The brown epidermis of the scale was raised in blisters or pimples similar to those commonly found on the one-year-old wood. The number of pustules on the scale ranged from one to six. In some cases they occurred at the extreme base of the scale, on its line of attachment to the stem, the fungus infesting both scale and stem and apparently retarding the fall of the former. Instances of imperfect abscission were also observed, the scab-infected base of the scale remaining attached. In this connexion it should be remembered that pustules of *V. inaequalis* occur on the very short one-year-old growths forming part of the spur on which the blossom buds are borne terminally. Such pustules are in equally close proximity with the first-formed leaves as those situated on the bud scales.

This discovery emphasizes the absolute necessity of one or two pre-blossom applications of Bordeaux mixture or lime-sulphur, since there is little likelihood that the pustules on the scales can be destroyed by winter spraying.

SCHOUTEN (J.). **Ergebnis eines Spritzversuches mit Nosprasit zu Äpfeln und Birnen.** [Result of a spraying experiment with nosprasit on Apples and Pears.]—*Nachricht. über Schädlingsbekämpf.*, vi, 2, pp. 56–59, 3 figs., 1931.

Excellent control of pear and apple scab [*Venturia pirina* and *V. inaequalis*] has been given in recent experiments in Holland by nosprasit, applied at a strength of 1·5 per cent. shortly before the buds burst and at 1 per cent. after petal fall [*R.A.M.*, ix, pp. 764, 790]. The treated trees yielded a high proportion of clean fruit. Rough-skinned apple varieties, e.g., Goldreinette, and stone fruit should be sprayed with a 0·75 to 1 per cent. solution immediately after blossoming, and subsequently at a strength of 0·5 per cent.

BAILEY (F. D.) & ZELLER (S. M.). **The occurrence of Schizophyllum commune on green Apples.**—*Mycologia*, xxiii, 2, pp. 154–155, 1 fig., 1931.

In the autumn of 1926, green apples thinned from the trees in summer and found lying on the ground under Spitzenberg and Red Cheek Pippin trees in an Oregon orchard were noted by the authors as being, in a large percentage of cases, infected with *Schizophyllum commune* [*R.A.M.*, ix, p. 267]. A brown dry rot had developed in the affected tissues, and by October and November mature sporophores were present on the surface and stalk.

GARD (M.). **Sur un traitement du Monilia du Prunier d'Ente en 1930.** [On a treatment of *Monilia* disease of d'Ente Plum trees in 1930.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 112–114, 1931.

On 1st April, 1930, a number of 20-year-old, vigorous plum trees which had annually been affected with *Monilia* disease [*Sclerotinia cinerea*: *R.A.M.*, viii, p. 655] were sprayed with one or other of the following fungicides; lead arsenate, a commercial preparation containing diplumbic arsenate and lysol, lysol, and 1·5 per cent. neutral Bordeaux mixture. Other plum trees were left untreated as controls.

Although the prevailing weather conditions strongly favoured infection, the fruits on the treated trees showed no spotting, whereas all those on the untreated controls were spotted and small.

None of the affected trees showed any trace of insect infestation.

VAN DER PLASSCHE (A. W.). **Proefneming bij Roode Bessen (Duitsche Zure) met verschillende kalibemestingen in verband met de aantasting door randjesziekte.** [Trials of various potash fertilizers for Red Currants (German Sour) in connexion with infection by leaf scorch.]—*Tijdschr. over Plantenziekten*, xxxvii, 6, pp. 131–134, 1931.

In order to test the effect of different kinds and quantities of potash fertilizers on the incidence of leaf scorch in red currants of the German Sour variety in Holland [*R.A.M.*, ix, p. 43], the following treatments were given: 1,200 and 2,400 kg. patent potash per hect.; 600 and 1,200 kg. potassium sulphate; 750 and 1,500 kg.

potash salt. The last-named proved definitely detrimental to the currants and its use should be discontinued. Both patent potash and potassium sulphate reduced the amount of leaf scorch but failed to control the disease completely, and no indication was obtained that the systematic application of fertilizers would appreciably increase the yield.

BERKELEY (G. H.). **Studies in fruit diseases. VII. Raspberry inspection service and Canadian certified Raspberry stock.**—*Canada Dept. of Agric. Pamphlet* 139, N.S., 6 pp., 1 fig., 1931.

Notes are given on the rules and regulations applying to the production of certified raspberry stock in Canada. The certification standards in respect of diseases have already been quoted [*R.A.M.*, x, p. 393].

DOBROSCKY (IRENE D.). **Studies on Cranberry false blossom disease and its insect vector.**—*Contrib. Boyce Thompson Inst.*, iii, 1, pp. 59–83, 11 figs., 1931.

This is an amplification of the author's recent communication [*R.A.M.*, ix, p. 324] on her studies of the spread of the false blossom disease of cranberries (*Vaccinium macrocarpon*) [ibid., x, p. 471] by the leafhopper *Euscelis striatulus*. In addition to the information already noticed, it is stated that attempts to transmit the disease by mechanical means were unsuccessful. Of the 44 species of leafhoppers [a list of which is given] which were found in cranberry bogs in Massachusetts, Long Island, and New Jersey, and most of which were tested, *E. striatulus* alone gave positive results, and for this reason a description of the insect and an account of its life-history and habits are given. Adults of this species collected on apparently healthy plants did not transmit the disease. No histological differences could be detected in healthy and infected individuals. All attempts by the author and other workers to transmit the disease to the blueberry (*V. corymbosum*) gave negative results, but it is stated that Sawyer reports that *V. oxycoccus* is susceptible.

It is suggested that the disease may be controlled by measures directed towards the suppression of the insect vector, and that a search be made for resistant varieties of cranberries.

WARDLAW (C. W.). **The biology of Banana wilt (Panama disease). III. An examination on sucker infection through root-bases.**—*Ann. of Botany*, xlv, 179, pp. 381–399, 1 pl., 20 figs., 1931.

In this paper the author, in continuation of his previous studies of the biology of *Fusarium cubense* [*R.A.M.*, x, p. 324], describes in detail investigations made to ascertain whether the susceptibility of Gros Michel bananas to infection by this fungus is constant for all external conditions or whether infection may be delayed or prevented by modifying adverse soil factors.

It was found that suckers in well-aerated, moist soils heavily infected with *F. cubense* do not become diseased through the cut basal end or superficial wounds, including old leaf bases. Such possible infection courts are only slightly invaded, deeper penetra-

tion being prevented by the formation of a suberized cambiform layer. If the plant at the time of being wounded is growing in a waterlogged or inadequately aerated soil, this, by impeding the rapid deposition of the suberin and the growth and division of tissues, will tend to promote infection.

Sucker infection appears to be mainly lateral in origin and associated with diseased root bases or cavities produced by boring insects, such as *Cosmopolites sordidus.* Under favourable soil conditions, penetration of the suckers by the fungus through exposed root bases is prevented by the secretion of wound gum, vessel collapse, and the occlusion of the vessel cavities by tyloses. Significant infection of the sucker takes place in the absence of boring insects when external conditions have induced a marked amount of root disease close to the root base. Once the hyphae have reached the sucker stele their further spread through the sucker apparently becomes inevitable.

It was demonstrated experimentally that banana roots grown in acid, neutral, or alkaline soils heavily inoculated with *F. cubense* but well aerated and kept uniformly moist do not become infected even after 40 days. Variation in the supply of soil moisture, such as that caused by the drying out of an open soil, or the introduction of a plasmolyzing agent, leads to root infection.

These results are considered definitely to establish the author's view that infection of Gros Michel bananas by *F. cubense* is conditioned by external factors.

SIDERIS (C. P.) & PAXTON (G. E.). **Pathological, histological, and symptomatological studies on Pineapple root rots.**—*Amer. Journ. of Botany*, xviii, 6, pp. 465–498, 25 figs., 1931.

Nine species of *Nematosporangium*, eleven of *Pythium*, *Pseudopythium phytophthoron*, *Phytophthora meadii*, and *P. melongenae* were found to be more or less pathogenic to Smooth Cayenne pineapple roots in Hawaii [*R.A.M.*, x, p. 555]. Taxonomic studies on these organisms are being published elsewhere. The most severe damage was caused by *N. rhizophthoron*, *N. polyandron*, *Pythium splendens*, and *P. diameson*, while a certain amount of injury is caused by *P. artotrogus* and *P. irregulare* [ibid., viii, p. 187]. The incidence of root rot due to *Pseudopythium phytophthoron*, *Phytophthora meadii*, and *P. melongenae* is slight and mostly restricted to the winter months.

The various species of *Pythium* concerned in pineapple root rot may be differentiated in the diseased tissues by the presence or absence of oospores and by the morphology of these bodies. The oospores of the different species may be distinguished from one another in the host tissues by their size, by their position in relation to the oogonium, and by the character of their surfaces, smooth, spiny, or polymorphic.

Root rot caused by Pythiaceous organisms is thought to be an important factor in the development of the common pineapple disease known as 'wilt', a term regarded as misleading since wilting is not a prominent feature of the condition. Affected plants turn to various shades of yellow, scarlet, and brown, sometimes with marked drooping but more often becoming shrivelled. Such

plants are found, on removal from the soil, to possess only the vestiges of a root system, most of the roots being dead and rotten.

Species of *Fusarium* have often been suspected in connexion with this form of root rot, and one species closely allied to *F. affine* [ibid., v, p. 543 *et passim*] was found capable of establishing itself on weak or dead small laterals, killing the healthy tissues by means of toxic metabolic by-products, and then advancing inwards. In severe cases the injured roots may die [ibid., ix, p. 325]. Infection by this species of *Fusarium* is favoured by drought, and under field conditions it is likely to be of minor importance. A species of *Verticillium* closely related to *V. buxi* and *V. heterocladium* (conidia 5 by 2·5 μ) occasionally caused the death of pineapple roots which were invaded through the cortex and stele, but this organism is also of secondary importance.

TALBERT (T. J.) & SWARTWOUT (H. G.). **Spraying investigations.**—*Missouri Agric. Exper. Stat. Bull.* 301, 16 pp., 5 figs., 1931.

Dry lime-sulphur (4 to 5 lb. per 50 galls. water) has been found to be an effective substitute for liquid lime-sulphur (1¼ galls. in 50 galls) in the control of apple scab [*Venturia inaequalis*] in Missouri. The former preparation gives a superior finish to the fruit and is less likely to injure the foliage than the liquid lime-sulphur, which causes the so-called 'spot burning'.

It was found that the concentration of Bordeaux mixture could safely be reduced to 2–4–100 without detriment to its efficacy as an orchard fungicide. When used against leaf spot of cherry [*Coccomyces hiemalis*] Bordeaux mixture gave slightly better control than lime-sulphur in years of heavy infestation, but in general the latter is preferable for this purpose owing to the dwarfing effect of Bordeaux on the fruit [*R.A.M.*, vi, p. 240].

PETRI (L.). **L'azione anticrittogamica dello solfo secondo vecchie e recenti ipotesi.** [The fungicidal action of sulphur according to old and new theories.]—*Boll. R. Staz. Pat. Veg.*, N.S., x, 4, pp. 367–379, 1930.

In this paper the author briefly summarizes and discusses the results obtained in the more important investigations which have been conducted in recent years to determine the true nature of the fungicidal properties of sulphur. Most of the information presented has already been noticed from other sources [*R.A.M.*, ix, pp. 467, 468, 732 and next abstract].

MCCALLAN (S. E. A.) & WILCOXON (F.). **The fungicidal action of sulphur. II. The production of hydrogen sulphide by sulphured leaves and spores and its toxicity to spores.**—*Contrib. Boyce Thompson Inst.*, iii, 1, pp. 13–38, 2 figs., 6 graphs, 1931.

This is the full account of the authors' experiments in the study of the production of hydrogen sulphide from spores of fungi or leaves of higher plants in contact with sulphur dust, an abstract

of which has already been noticed [*R.A.M.*, x, p. 395: owing to an oversight the name of the senior author was omitted in this abstract]. In addition to the information already noted it is stated that actual contact between the sulphur and the spores is not necessary for the production of hydrogen sulphide: the reaction was shown to take place through a collodion membrane or even across an air space of 3 or 4 mm., the hydrogen sulphide being produced on or within the spores and not on the sulphur. The sensitivity of the spores of eight species of fungi tested to the toxic action of hydrogen sulphide and of sulphur was found to range in the following descending order: *Venturia inaequalis*, *Uromyces caryophyllinus*, *Puccinia antirrhini*, *Sclerotinia americana*, *Macrosporium sarcinaeforme*, *Pestalozzia stellata*, *Glomerella cingulata*, and *Botrytis cinerea*. If the production of hydrogen sulphide by the spores of these species is expressed in units equal to the amount necessary to reduce their germination by 50 per cent., it is found that the four first-named species (controllable in the field with sulphur) produce more than one unit, while the four relatively resistant species (not amenable to control with sulphur) produce considerably less than one unit of hydrogen sulphide. On the basis of these facts the hypothesis is advanced that sulphur vapour diffuses from the sulphur particles to the spores and is reduced within the spore to form as an end product toxic hydrogen sulphide. The reaction is believed to be enzymic and is probably concerned with $-SH$ compounds.

MAGEE (C. J.). **Steam sterilization of soils. With special reference to Tomato glass-houses.**—*Agric. Gaz. New South Wales*, xlii, 6, pp. 428–432, 2 figs., 1931.

A brief description is given of the inverted pan system of soil sterilization by steaming [*R.A.M.*, x, p. 609], which is considered to be the most advantageous under New South Wales conditions, especially for the control of soil-borne organisms, e.g., *Fusarium lycopersici* (tomato wilt), in glass-houses.

NIETHAMMER (ANNELIESE). **Über den Einfluss einzelner Beizmittel auf die Bodenmikroflora.** [On the influence of certain fungicides on the soil microflora.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 6, pp. 257–266, 1931.

The writer tested the effects of ceresan, tutan, uspulun-universal, germisan, and abavit on cultures of various soil organisms, including *Mucor racemosus*, *Actinomyces odorifer*, *Fusarium nivale* [*Calonectria graminicola*], *Aphanomyces cochleoides*, and *A. camptostylum*, the two last-named grown in pure sand and the others in garden soil with the addition of nutrient solutions. The fungicides were used at the rate of 0·001 gm. per 100 c.c. of solution. *M. racemosus* was kept at 20°, *C. graminicola* at 10° to 15°, and the two *Aphanomyces* at 18° to 20°. Permanent injury by the preparations in question was inflicted only on the *Aphanomyces*, the growth of *M. racemosus* and *C. graminicola* being merely temporarily checked.

RANGEL (E.). **Contribuição para o glossario portuguez referente á mycologia e á phytopathologia.** [Contribution to a Portuguese glossary referring to mycology and phytopathology.]—*Min. Agric. Brasil, Inst. Biol. Defesa Agric.*, 72 pp., 1931.

An alphabetical list is given of some Latin or Latinized words in common use in mycological and phytopathological literature, with their equivalents in Portuguese.

CHAUDHURI (H.) & AKHTAR (A. R.). **A study of the root-tubercles of Podocarpus chinensis.**—*Journ. Indian Bot. Soc.*, x, 2, pp. 92–99, 2 pl., 1931.

The tubercles of *Podocarpus chinensis* in the Lahore district of the Punjab were found to form both ecto- and endotrophic mycorrhiza [cf. *R.A.M.*, x, pp. 258, 398]. The endophyte consists of clustered, non-septate hyphae occupying a spherical mass of parenchymatous cells surrounding the tip of the single vascular strand that penetrates the tubercle. In attempts to isolate the organism the fungus chiefly obtained was sterile, with non-septate hyphae from 3·7 to 5·5 μ in thickness.

Notes are given on the anatomical structure of the tubercles.

BLOCHWITZ (A.). **Die Farbstoffe der Schimmelpilze.** [The pigments of the moulds.]—*Ber. Deutsch. Bot. Gesellsch.*, xlix, 3, pp. 131–137, 1931.

Continuing his investigations on the phenomenon of heterochromia in various species of *Aspergillus* and *Penicillium* [*R.A.M.*, viii, p. 675], the writer gives details of some striking colour changes exhibited by the mycelium and reproductive organs of these fungi under the action of certain chemicals. It is believed that many so-called 'new species' of these genera have been created purely on the ground of these temporary variations in pigmentation. *Penicilliopsis clavariaeformis* and *P. brasiliensis* underwent similar alterations.

BLOCHWITZ (A.). **Der Farbstoff der Penicilliopsis Solms-Laubach.** [The pigment of *Penicilliopsis* Solms-Laubach.]—*Ber. Deutsch. Bot. Gesellsch.*, xlix, 6, pp. 319–323, 1931.

Further details are given on heterochromia in the moulds, with special reference to *Penicilliopsis* [see preceding abstract] isolated from *Diospyros* fruits at Buitenzorg, Dutch East Indies.

WALLACE (G. I.) & TANNER (F. W.). **Effect of heat on mold spores.**—*Proc. Soc. Exper. Biol. & Med.*, xxviii, 9, pp. 970–972, 1931.

After a brief survey of the work of previous investigators on the thermal death points of the moulds commonly occurring in preserved foodstuffs, the writers describe their experiments with *Rhizopus nigricans*, *Mucor mirus*, *Aspergillus niger*, *Oidium* [*Oospora*] *lactis*, *Alternaria solani*, and *Trichothecium* sp. Spores from pure cultures were suspended in 1, 3, and 6 per cent. salt solutions, 10, 25, and 50 per cent. sugar solutions, juice from pitted red cherries in syrup, and distilled water. Sealed tubes containing 2 c.c. of the suspensions were submerged in water baths at tempera-

tures of 50°, 55°, and 60° C., and at 5-minute intervals a tube of each mould was taken out and submerged in cold water. On completion of cooling, the tubes were wiped with disinfectant, broken, and 1 c.c. of the contents added to a sterile Petri dish for culture.

With *R. nigricans* the salt solution, cherry juice, and distilled water suspensions all acted in a similar way, the organism being completely destroyed within 20 minutes at 50° and within 10 at 55°. In the sugar solution suspensions a period of 30 minutes at both temperatures was necessary for the complete destruction of the spores. The death rate was apparently not influenced by the sugar percentage. Similar results were obtained with *Aspergillus niger*, except that a slightly higher temperature was necessary to kill the spores; at 55° this took 30 minutes. With *Alternaria solani* and *M. mirus* the salt solution suspensions were the hardest to destroy, resisting 50° for 30 minutes, but succumbing within 10 minutes at 55°, while the sugar solution suspensions were killed within 25 minutes at 50° and in 5 to 10 at 55°. Both the salt and sugar suspensions of the species of *Torula* were destroyed within 30 minutes at 50° and in 5 at 55°. *O. lactis* resisted 60° for 30 minutes in all suspensions.

EMMONS (C. W.). **Cicinnobolus cesatii, a study in host-parasite relationships.**—*Bull. Torrey Bot. Club*, lvii, 7, pp. 421–441, 3 pl., 1930. [Received July, 1931.]

This is a detailed account of the author's study of the morphology and development of *Cicinnobolus cesatii* [*R.A.M.*, viii, p. 113] on *Erysiphe cichoracearum* on Jerusalem artichoke from New Jersey. The organism exhibits a high degree of adaptability to the parasitic habit, causing death of the invaded cells of the sporophore or ascocarp of its host by gradual stages. It is then capable of continuing its development as a saprophyte, and on the approach of winter it is sometimes found in the epidermal cells and intercellular spaces of the leaves of the Jerusalem artichoke. The fungus was grown in pure culture, and developed pycnidia under these conditions.

PEROTTI (R.). **Le mico-batteriosi.** [Myco-bacterioses.]—*Rendic. R. Accad. Lincei*, xiii, Ser. VI, 8, pp. 627–629, 1931.

In the diseased fruits and inflorescences of oleanders the author found *Alternaria tenuis* constantly present in association with a bacterium. When the two organisms were grown together in culture on the same plate the zones of *A. tenuis* which were nearest to the bacterium grew best. The latter was observed to exude an acid secretion, the underlying medium turning yellow, though the medium under the fungal part of the colony did not change colour. From this it is deduced that the growth of both organisms was correlated, the bacterium emitting a substance which contributed to the growth of the fungus. A similar instance was observed in which oleanders showed the presence of a 'parasitic symbiosis' between *Fusarium martii* and two related bacterial forms which strongly acidified the neutral culture medium, though the fungus did not acidify it. Other parallel cases are referred to

[cf. *R.A.M.*, ix, p. 52], and the author concludes that the presence of bacteria in fungal infections of the higher plants is not a secondary phenomenon but an integral, more or less definite, symbiosis between fungal and bacterial forms; it should be referred to as a myco-bacteriosis.

GUYOT (A. L.). **De quelques balais de sorcière nouveaux ou peu connus.** [On some new or little known witches' brooms.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 142–151, 2 pl., 1931.

A brief description is given of a number of witches' brooms observed by the author in 1930 in northern France, including one on *Silene maritima* caused by a species of *Uromyces* with morphological and biological characters intermediate between those described for *U. behenis* and *U. inaequialtus*; one on *Galeopsis ladanum* var. *littoralis*, due to mechanical injury of the stem; and one on *Arenaria trinervia* caused by *Puccinia arenariae*. The broom produced on marjoram (*Origanum vulgare*) by *P. rübsaameni* [*R.A.M.*, ix, p. 399], and previously reported only from a few localities in the departments of the Somme and the Seine-Inférieure, was observed in July, 1930, near Mantes.

TUCKER (J.). **Canadian certified seed Potatoes: rules and regulations governing their production.**—*Canada Dept. of Agric. Pamphlet* 129, N.S., 14 pp., 1 fig., 1 diag., 1931.

In 1930 a total area of 34,000 acres of potatoes was inspected for certification in Canada, and the total amount of certified seed was about 5,000,000 bushels [*R.A.M.*, ii, p. 465; vi, p. 250; vii, p. 533]. The export trade is stated annually to require 1,500,000 bushels of certified seed. The following are the standards in respect of some important field diseases: blackleg [*Bacillus phytophthorus*], up to 3 per cent. at the first inspection and 1 per cent. at the second; leaf roll, mosaic, and spindle tuber, 2 and 1 per cent., respectively; wilts [*Fusarium oxysporum* and *Verticillium albo-atrum*], 3 and 2 per cent. Total of all diseases not more than 6 per cent. on the first or 3 per cent. on the second inspection. The following are the maximum amounts of tuber infection permitted: bacterial wet rot, 0·5 per cent.; late blight [*Phytophthora infestans*] and dry rot [*F. coeruleum*], 1 per cent.; scabs [*Actinomyces scabies* and *Spongospora subterranea*] and *Rhizoctonia* [*Corticium solani*], 10 per cent. slight (of which not more than 1 per cent. may be *S. subterranea*) or 5 per cent. severe [cf. ibid., x, p. 484]. Maximum allowed 7 per cent. except in the case of slight *A. scabies* or *Rhizoctonia*.

Popular notes are given on some important factors contributing to successful potato production, together with full instructions for obtaining certification.

QUANJER (H. M.). **The methods of classification of plant viruses, and an attempt to classify and name Potato viruses.**—*Phytopath.*, xxi, 6, pp. 577–613, 8 figs., 1931.

The writer discusses at some length the respective merits of the principal methods in current use for the identification, differentia-

tion, and classification of plant viruses, and concludes that present knowledge is inadequate for such a classification, and that the method based on morbid anatomy and physiology has so far been somewhat neglected. Investigations on potato leaf roll have shown that a better idea of the pathological processes, exemplified by phloem necrosis, can be obtained by a correlation of the histological and physiological methods [cf. *R.A.M.*, x, p. 332].

A standard named collection of potato virus material from leading workers of the Old and New World being available, an attempt was made to find a new basis for the classification and nomenclature of potato viruses, founded on readily recognizable microscopic characters. The principle adopted was that a potato virus should be identified, named, and classified according to its pathological effect on a variety showing clearly definable internal symptoms. One of the best differential hosts for this purpose is the Paul Krüger (President) variety, the international use of which is recommended.

In order to avoid further confusion through the use of descriptive names for a constantly increasing number of mosaics, crinkles, streaks, and spottings, the following international nomenclature is proposed for potato virus diseases. (1) Anecrotic mosaics, characterized only by mottling and some wrinkling of the leaflets, without necrosis, streak, or drop of the lower leaves of stocks on which the virus-carrying scion is grafted, e.g., mild, intermediate, crinkle, and interveinal mosaics. (2) Phloem necrosis, represented by leaf roll and (as a result of inoculation in Green Mountain tubers) net necrosis [ibid., ix, p. 477]. (3) Acronecrosis or top necrosis of the foliage, stem, and tubers [ibid., ix, p. 482], wherein the necrotic area radiates from a comparatively small number of the internal phloem strands into the adjoining parenchyma, which is surrounded by a cork cambium except at the tender tips of the shoots, which are rapidly destroyed. This disease, produced by the 'healthy potato' virus [ibid., x, p. 682] occurs in most of the American standard varieties, as well as in Duke of York and Jaune d'Or, and shows up after grafting these carriers on to a differential host. (4) Acropetal necrosis (comprising rugose mosaic and certain types of crinkle and streak) affects chiefly the collenchyma of the leaf veins, petioles, and stems, sometimes extending gradually to other tissues. Some European varieties are thought to bear this virus in a latent form and consequently behave as carriers. (5) Phloem-parenchyma necrosis of the tuber (pseudo-net necrosis) [ibid., x, p. 400], with which no foliar symptoms are associated. The necrotic spots are restricted to the storage parenchyma adjoining the external and internal phloem of the tubers, and the infective principle is perpetuated by the seed. Fruwirth's 'hereditary sprain' [ibid., ix, p. 199] is thought to be probably due to the same virus. (6) Concentric necrosis of the tuber, comprising the conditions known as 'kringerigheid', 'Propfenbilding', certain types of 'Eisenfleckigkeit', and possibly 'internal brown spot' or 'internal rust spot' (all corresponding to Swellengrebel's 'maladie des tâches en couronne') [ibid., iii, p. 478; ix, p. 478]. This disease is characterized by necrotic spots in the storage parenchyma appearing on the cut surface as concentric brown rings arising

from some point on the skin, often a lenticel. Infection is not transmitted by seed tubers, and evidently takes place through the soil.

A bibliography of 100 titles is appended.

ELZE (D. L.). **The relation between insect and virus as shown in Potato leaf roll, and a classification of viroses based on this relation.**—*Phytopath.*, xxi, 6, pp. 675–686, 1931.

In connexion with an investigation on the part played by insects in the dissemination of virus diseases (especially leaf roll) of the potato, the writer describes and discusses the results of experiments on the spread of this disease from infected to healthy tubers by means of various insects [cf. *R.A.M.*, ix, p. 477]. The 22 healthy tubers planted in each of four greenhouses with one tuber from a leaf roll plant belonged to the President, Duke of York, and Roode Star varieties, the diseased material being taken from Bevelander, Green Mountain, Rural, and Irish Cobbler. The insects used in the tests were *Myzus persicae, Aphis rhamni, A. fabae*, and *Psylliodes affinis*.

M. persicae transmitted the virus to all the 22 plants, *A. rhamni* to 13, *A. fabae* to 6, and *P. affinis* to 8. The relatively low transmitting capacity of the last-named insect is attributed to the fact that insects with cutting mouth parts can cause infection only through virus that may accidentally adhere to those parts. In the case of the aphids, however, the virus is, no doubt, injected into the plant with the saliva, and the differences in capacity for virus transmission are thought to be due to variations in the degree to which the virus is inactivated by the internal organs and their secretions. The adaptability of the virus to the aphid is most marked in the case of *M. persicae*, comparatively weak in that of *A. rhamni*, and practically non-existent with *A. fabae*, infection by which appears to take place almost exclusively through virus accidentally present on the stylets. It was shown by an experiment during the winter of 1929–30 that *M. persicae* and *Macrosiphum solanifolii* [*M. gei*] do not lose their powers of transmission while moulting, the percentage of successful transmissions by viruliferous individuals being almost as high after as before this process.

The fact that most European workers regard *Myzus persicae* as the sole important vector of leaf roll is ascribed to the use of different experimental methods from those employed by the writer.

On the basis of the information at present available regarding the significance of insects in virus transmission the following system of classification is proposed [cf. preceding abstract]. (1) Viroses apparently not disseminated by insects, e.g., peach yellows and sandal [*Santalum album*] spike [see above, p. 697]. (2) Viroses spread by different insects and not specially adapted to any one of these, e.g., cucumber mosaic. (3) Viroses adapted to particular insects and (A) also transmitted mechanically by other insects, e.g., potato leaf roll and spinach blight; (B) transmitted only by the insect to which the disease is adapted (*a*) with a short incubation period of the virus in the insect, e.g., curly top

of beet and maize streak ; (*b*) with an incubation period of 10 to 14 days, e.g., aster yellows.

ZIEGLER (O.). **Zur Biologie der Kartoffel. VIII. Mitteilung. Kritische Betrachtungen zur Oekologie des Abbaues.** [On the biology of the Potato. Note VIII. Critical speculation on the ecology of degeneration.]—*Arb. Biol. Reichsanst. für Land- und Forstw.*, xix, 2, pp. 135–154, 1931.

The present contribution to the series of papers dealing with various aspects of the biology of the potato is a discussion, based mainly on the data in the literature but also on the author's observations at Weihenstephan, Bavaria, of the influence of various ecological factors on degeneration in the sense used by Morstatt and Merkenschlager [*R.A.M.*, iv, p. 426; x, p. 682].

MERKENSCHLAGER (F.), SCHEER (W.), & KLINKOWSKI (M.). **Zur Biologie der Kartoffel. X. Mitteilung. Der Dahlemer Abbauboden.** [On the biology of the Potato. Note X. The Dahlem degeneration soil.]—*Arb. Biol. Reichsanst. für Land- und Forstw.*, xix, 2, pp. 199–210, 4 figs., 2 diags., 2 graphs, 1931.

The soil of Dahlem, Berlin, constitutes a perfect medium for the development of 'degeneration' in potatoes [see preceding abstract]. Instances are cited of potato failures on this soil and of the universal susceptibility to disease of potatoes grown in it. A detailed account is given of its physical and ecological characteristics and of its geological origins, from a study of which it is considered to be evident that the pathological phenomena in question are correlated with irregularities in the water balance of the soil.

NEWTON (J. D.). **Sulphur oxidation in Alberta soils and related experiments.**—*Scient. Agric.*, xi, 9, pp. 612–622, 3 figs., 1931.

The results of laboratory experiments from 1928 to 1930 and of a small range of field tests in 1930 [some details of which are given] with three widely different types of Alberta soils (namely, Edmonton black loam, Brooks brown loam, and Breton grey or wooded loam) showed that applications of sulphur at the rate of three tons per acre gave practically entire control of common scab [*Actinomyces scabies*] of potato on these soils, but slightly reduced the yield in the Edmonton and Brooks loams and seriously in the Breton loam. The application of one ton per acre had little effect on the yield, but did not give effective control of the disease on any of the soils.

Determinations in 1929 of the soil reaction showed that the untreated soils were the least acid and the soils which had received sulphur at the rate of three tons per acre were the most acid. The fact, however, that the P_H values of the soil fluctuated considerably throughout the season, taken together with similar observations of other workers, would render it doubtful whether any given soil has a perfectly definite and stable P_H value. The numbers of bacteria present in the soils were generally reduced by increase in acidity, but the numbers of fungi were not correspondingly reduced.

It is pointed out that although the investigation indicates that common scab of potato may be satisfactorily controlled in Alberta by the application of relatively large quantities of sulphur, the costliness of the method does not warrant its use for the production of only one scab-free crop of potatoes. It is suggested, therefore, that sulphur-treated lands might be retained for continued potato growing, the required acidity in them being maintained by occasional applications of relatively small quantities of sulphur.

MOORE (H. C.), WHEELER (E. J.), & BIRD (J. J.). **Hill spacing tests with Potatoes.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, xiii, 4, pp. 203–205, 1931.

The results of five years' experiments at the Michigan Agricultural Experiment Station [*R.A.M.*, viii, p. 58; ix, p. 199] showed that close spacing of hills (12 to 18 inches apart in the row) reduced the incidence of hollow heart in potatoes and considerably increased the yield. In 1926 and 1928, when the August rainfall was above normal, this practice reduced the amount of hollow heart from 16 to 3·6 per cent. (average of 18 tests) and resulted in an increased production of some 40 bushels per acre.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon, 1930.**—*Trop. Agriculturist*, lxxvi, 5, pp. 270–273, 1931.

This is a brief report on the general health of *Hevea* rubber plantations in Ceylon in 1930, and also on the diseases and pests which were observed attacking rubber nursery stock. Most of the recent information contained in it has already been noticed from other sources. [This paper is also printed in the *First Quart. Circ. for 1931, Rubber Res. Scheme* (Ceylon), pp. 1–4, 1931.]

DE HAAN (J. T.). **Meeldauwbestrijding in Midden-Java in '30.** [Mildew control in Central Java in 1930.]—*De Bergcultures*, v, 24, pp. 649–651, 1931.

Dusting with sulphur for the control of *Hevea* rubber mildew [*Oidium heveae*: *R.A.M.*, x, p. 549] was carried out on 18 estates in Central Java during 1930, the Björklund apparatus being used on 7, the Sulzer on 6, and the Holder on 5. Apart from a few minor constructional defects these machines functioned satisfactorily in most cases. On two estates dusting was begun in the middle of May, while on others it was not commenced until June, July, or even the first week in August. In some cases the first applications were made when 5 to 30 per cent. of the trees showed new growth. Observations on the connexion between normal leaf fall and mildew development, as recommended by the Experiment Station, were only made in a few cases; the importance of such data in the successful control of the disease is emphasized. At a rough estimate, the dusting operations covered an area of at least 8,700 hect., or about 50 per cent. of the entire area under rubber in Central Java. The number of applications ranged from one to nine, and the amount of sulphur used at each from 2 to 18 kg. per bouw [1 bouw = 0·71 hect.], mostly 6 kg. Kawah Poetih sulphur [ibid., ix, p. 804; x, p. 56] was used on 12 estates and sulphur smoke [ibid., ix, p. 26] on 6; the results in both cases were quite satisfactory.

The former preparation is cheaper and (according to one report) less inflammable than sulphur smoke. In most cases dusting was begun at 8 a.m. and continued until midday, 5 to 20 bouws being covered per hour. On the majority of the estates the sulphur applications were discontinued after most of the trees had completed putting out their new leaves. Although actual statistics were not forthcoming, most of the estate-owners were agreed as to the beneficial effects of the treatment. The cost of the operations ranged from Fl. 0·85 to 3·09 per application and per bouw [about 9*d*. to 3*s*. per acre] on the different estates, the total cost per bouw (including depreciation) being estimated at Fl. 1·70 to 8·20. Sulphur was the principal item in these costs (up to 80 per cent. of the total), the price of fuel and oil generally amounting to only 3·5 to 5 cents per bouw.

McLennan (Ethel I.). **A disease of Hops in Tasmania and an account of a protomyxean organism, Leptomyxa reticulata Goodey var. humuli (nov. var.), associated with it.**—*Australian Journ. Exper. Biol. & Med. Sci.*, viii, 1, pp. 9–44, 2 pl., 18 figs., 1931.

This is a detailed account of the author's study of a disease of hops in Tasmania, locally known as 'take-all', the occurrence of which in that island has been recorded for the last ten years or more. As far as could be ascertained, the condition described by Nicholls in 1922 and attributed by him to *Plasmodiophora humuli* Kirk [*R.A.M.*, ii, p. 305] was this disease, but the author's investigations failed to establish the constant presence in the diseased plants of a causal organism. Histologically the condition is characterized by a necrosis of the phloem and cambium of the larger roots and lower part of the bines, accompanied by fissures extending through the wood and cortex and a copious formation of gum. All the evidence collected points to the disease being due to a virus, and it is believed that it is probably identical with 'false nettlehead' of hops in England [ibid., v, p. 185], since the symptoms in both are very similar and both occur chiefly on the hop variety Fuggles, although in Tasmania the variety Golden Cluster is not absolutely immune. It is further pointed out that the name *Plasmodiophora humuli* cannot be recognized as valid [cf. ibid., x, p. 4], since it was applied by Kirk to a crown gall-like condition of the hop in New Zealand, without any description or investigation of the causal organism. The examination of specimens of Kirk's disease preserved at Melbourne showed that the anatomy of the tumours corresponds to that of crown gall due to *Pseudomonas* [*Bacterium*] *tumefaciens*, and no trace of the presence of a myxomycete was found in the diseased tissues.

In the course of the author's studies special attention was given to a plasmodial organism which was observed in, and isolated from, the tissues of a certain number of the diseased hop plants from Tasmania, although it is probably only a secondary parasite. The organism was grown and maintained in the laboratory for a considerable time on a medium prepared from six to ten wheat grains which were first boiled to kill the embryo, and then soaked in 100 c.c. of tap water in Erlenmeyer's flasks for one or two days

at 20° to 25° C., after which the organism was transferred to the flasks and incubated in the dark at 25°; Horlick's malted milk was also useful as a nutrient medium. The organism was found to belong to Hickson's section Proteomyxa (closely corresponding to Zopf's group Monadinae which was created at the same time but has not been retained in literature), and was identified as a new variety *humuli* of *Leptomyxa reticulata* Goodey. This is stated to be the first record of the genus *Leptomyxa* from Australia, and it is believed that *L. reticulata* var. *humuli* is the first soil protozoon to be found parasitic on a higher plant.

The paper also includes a critical review of Jones's work on *Plasmodiophora tabaci* [ibid., v, p. 686], and the suggestion is put forth that this organism may eventually be shown to be identical with, or closely allied to *L. reticulata*.

Verslag van de cultuurafdeeling van het Proefstation voor de Java-Suikerindustrie te Pasoeroean over het jaar 1929. [Report of the cultivation section of the Experiment Station for the Java Sugar industry at Pasoeroean for the year 1929.] —128 pp., 4 graphs, Soerabaia, H. van Ingen, [? 1930. Received September, 1931.]

This report contains some scattered items of phytopathological interest of which the following may be mentioned. Smut (*Ustilago sacchari*) [*U. scitaminea*] was observed in young plants of the P.O.J. 2878 sugar-cane variety, apparently the first record on this variety in Java [cf. *R.A.M.*, x, p. 622]. The diseased plants had evidently originated from infected setts, as the symptoms take eight to ten months to develop, and growers were warned of the possibility of a further spread of secondary infection.

The results [which are tabulated] of counts on the incidence of pokkah boeng (*Fusarium*) [*Gibberella moniliformis*] again showed a decline in the later planted crops (June and July) as compared with those planted in April and May [ibid., ix, p. 270].

Red stripe disease (*Phytomonas rubrilineans*) first attracted attention in Java during 1928 [ibid., viii, p. 265] owing to the susceptibility of the new P.O.J. varieties. The economic importance of this disease cannot yet be forecast and the destruction of infected leaves in the young plantations is recommended.

Yellow spot disease (*Cercospora kopkei*) [ibid., viii, p. 226] occurred in a very severe form during 1929.

PETCH (T.). **Revisions of Ceylon fungi. Part IX.**—*Trans. Brit. Mycol. Soc.*, xv, 3–4, pp. 247–254, 1931.

Among the nine species of fungi dealt with in this paper [which is in continuation of the author's series of critical notes on Ceylon fungi: *R.A.M.*, vi, p. 697], the following may be mentioned.

The fungus described by Berkeley and Broome as *Tuber zeylanicum* and redescribed by the author in 'The Diseases of the Tea Bush' [*R.A.M.*, iii, p. 3] as *Sclerotium zeylanicum*, forms conspicuous white patches, up to nine inches or more in diameter, spreading over the soil or dead leaves, on which the sclerotia are produced; the latter are usually more or less uniform in size, but in some cases, especially on logs, the size varies considerably, some

of the sclerotia attaining a diameter of 5 mm.; when planted in damp sand these large sclerotia produced a white mycelium, which later developed small sclerotia. Although for the most part the fungus is a saprophyte, when the spreading mycelium in nature comes into contact with caladiums the latter are speedily killed. It is pointed out that the fungus, contrary to the statement in this *Review* [vi, p. 390], is quite common in Ceylon on dead wood and dead leaves, and is only rare there as regards its recorded attacks on tea. Should the contention of some workers that it is identical with *S. rolfsii* prove to be correct, the name *S. zeylanicum* is claimed to have priority.

In 1927 *Exobasidium zeylanicum* was found in abundance in Nuwara Eliya, Ceylon, on small plants of *Rhododendron arboreum*, none of which was over two feet high. The galls which are attached to the under side of the leaf, and when massed resemble a cluster of small apples, are spherical, up to 3 cm. in diameter, and solid. The hymenial layer on their surface is about 40 μ thick. The basidia are cylindrical, about 30 by 8 μ in diameter, four-spored, the sterigmata being stout, conical, and 4 to 6 μ high. The basidiospores are cylindrical or subcymbiform, straight or slightly curved, 10 to 16 by 3 to 4 μ, becoming one-septate. The secondary spores are usually clavate, sometimes cylindrical, with rounded ends, and measure 8 to 12 by 1·5 to 2 μ. *E. rhododendri* (*E. vaccinii* Wor.) [ibid., vi, p. 587; ix, p. 389] also occurred on *R. arboreum* in the same locality; it forms, on the leaves, circular shallow blisters, concave above and convex below. Its basidiospores are cylindrical, curved, 10 to 15 by 4 μ, becoming three-septate, and the secondary spores are cylindrical and 5 to 9 by 1·5 μ in diameter.

Legislative and administrative measures. Germany (Bremen). —*Internat. Bull. of Plant Protect.*, v, 6, p. 97, 1931.

An order of 31st March, 1931, concerning the control of elm disease (*Graphium ulmi*) [*R.A.M.*, x, p. 348] in Bremen requires the notification within a week, by owners or holders of land, of the occurrence of sudden withering or yellowing of the leaves, branches, or whole trees, or other symptoms of infection. The determination of the existence or otherwise of the disease will be made by the Bremen Plant Protection Station. On orders from the police the infected trees shall be felled or cut back, the cut surfaces of lopped trees coated with tar or carbolineum, felled branches burnt, the bark of felled trees removed and the infected bark and branches burnt, stumps of felled trees grubbed or coated with tar or carbolineum, and newly developing shoots destroyed annually. Infringements of this order will be punishable by a fine not exceeding M. 150 or up to 14 days' imprisonment.

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ARNAUD (G.). **Les Astérinées. V. Caliciacées, Hémisphériacées.** [The Asterineae. V. Caliciaceae, Hemispheriaceae.]—*Ann. des Épiphyties*, xvi, 5, pp. 235–302, 14 pl., 15 figs., 1930. [Received August, 1931.]

In continuing his study of the fumagines and allied groups of fungi [*R.A.M.*, v, p. 330] the author now considers the systematic position of the Coryneliaceae, a family which has been held to be allied to the Perisporiales. They are here, on the other hand, held to be Discomycetes, and are grouped with the genera *Coniocybe* (*Roesleria*), *Calicium*, and *Acrospermum* in the family Caliciaceae Fries emend. Rehm. Two species of interest to pathologists are referred to. *Roesleria hypogea* appears as *Coniocybe nivea* (Hoffm.) Rehm; and the widely distributed fungus on juniper galls, which is best known as *Ceratostoma juniperinum* [ibid., vii, p. 13], appears as the type species of a new genus, under the name *Lagenula nigra* (Schleicher).

BIRD (M.). **The toxic action of magnesia on Cane.**—*Facts about Sugar*, xxvi, 6, p. 263, 1931.

The so-called 'root disease' of sugar-cane on the alluvial coast soils of British Guiana [*R.A.M.*, x, p. 361] has been found to be due to the presence of excessive quantities of magnesia in the soil. Analysis of two samples of the ash of dead cane gave 24·28 and 25·40 per cent. magnesia, respectively, both soil and cane having over three times as much magnesia as lime. In order to observe the direct action of magnesia on sugar-cane, the writer applied 8 oz. of Epsom salts (containing about 16 per cent. magnesia) to the roots of each of four healthy stools on 4th May, 1930. On 15th August the treated canes were dead, while all the others in the same plot were making vigorous growth. In a field with a normal lime-magnesia ratio there were no signs of root injury. Owing to the impermeability of the stiff clay soils, the leaching out of the excess magnesia presents great difficulties. It is probably advisable to apply lime wherever analysis fails to show twice as much lime as magnesia in the soil.

TUCKER (C. M.). **Taxonomy of the genus Phytophthora de Bary.** —*Missouri Agric. Exper. Stat. Res. Bull.* 153, 208 pp., 29 figs., 1 graph, 1931.

In this comprehensive account, accompanied by 26 tables, of his investigations on 150 isolations of *Phytophthora* spp., the writer deals at length with the morphological characters of the genus and their relation to its taxonomy, as well as with the results of inoculation experiments on a large number of the commoner host plants of the genus, the behaviour of the fungus in different culture media, their temperature relations, and other points of interest.

Morphological characters are considered to be only of limited value in the identification of species. The predominance of the amphigynous or paragynous character of the antheridia was found to be a constant feature. The results of the inoculation tests showed that different isolations of the same species vary in pathogenicity, while there is evidence of the existence of biological strains within some species. In certain cases the ability to infect certain hosts may serve as a criterion for identification; for instance, *P. capsici* and *P. parasitica* var. *nicotianae* (the name suggested for the causal organism of black shank of tobacco) were the only species infecting pepper (*Capsicum annuum*) and tobacco, respectively.

The capacity of *Phytophthora* spp. in oatmeal agar cultures to survive exposure to winter temperatures in Missouri seems to be determined by an inherent character of the protoplasm of particular species or strains, and is, apparently, not generally correlated with the development of sexual spores or resting spores. *P. cambivora*, for instance, producing only mycelium, survived regularly. A similar absence of correlation between longevity and the production of particular spore types was observed in the laboratory.

Different species of *Phytophthora* were found to vary widely in their temperature relations, and especially in the capacity to develop at the higher temperatures, in maize meal agar cultures at a range of 5° to 37° C. Different isolations of the same species behave very similarly, indicating that response to temperature is a specific character. In the writer's opinion, this character is of taxonomic value.

Isolations of *P. palmivora* which did not develop oogonia and oospores in pure culture formed these bodies when certain isolations were grown in mixed cultures. In this connexion the recorded evidence concerning heterothallism, hybridism, and stimulation of sexual reproduction caused by the presence of another mycelium is discussed.

Considering in detail the taxonomic position of the genus and species, the writer finds that the most valuable characters for the differentiation of the latter in culture are ability to grow on certain media, type of antheridium, character of the sporangia, temperature relations, and (in a few species) development of certain types of reproductive organs, size of oospores, and pathogenicity. The following species are regarded as identifiable by these criteria: *P. infestans*, *P. cactorum*, *P. phaseoli*, *P. colocasiae*, *P. citrophthora*, *P. thalictri*, *P. palmivora*, *P. syringae*, *P. parasitica*, *P. erythro-*

septica, P. cambivora, P. cryptogea, P. capsici, P. cinnamomi, P. richardiae, P. boehmeriae [*R.A.M.*, ix, p. 405], and possibly *P. mexicana.*

P. drechsleri, isolated from rotting potato tubers by Drechsler, is characterized by non-papillate, ovate, piriform to obpiriform sporangia measuring 24 to 38 by 15 to 24 μ (average of 50, 31·4 by 21 μ); broadly clavate to subspherical, hyaline to pale amber, smooth oogonia, 21·7 to 53·4 μ (average 31·3 μ); spherical, smooth, hyaline to lemon-coloured oospores, 16·7 to 45·1 μ (25·6 μ); and amphigynous, persistent, subspherical to irregular antheridia of variable size. Growth occurred on maize meal agar between 10° and 37·5°, with an optimum from 30° to 32·5°. Inoculation experiments on apple fruits, potato tubers, eggplant fruits and seedlings, and papaw and tomato seedlings gave positive results.

P. fagi, P. omnivora, P. pini, P. pini var. *antirrhini, P. citricola*, and *P. paeoniae* are all considered to be identical with *P. cactorum*; while *P. arecae, P. fici, P. carica, P. faberi*, and *P. meadii* are combined with *P. palmivora. P. hibernalis* is thought to be a synonym of *P. syringae. P. parasitica* is regarded as comprising *P. melongenae, P. allii, P. terrestris, P. parasitica* var. *rhei, P. jatrophae*, and *Blepharospora terrestris. P. tabaci* is combined with *P. parasitica* var. *nicotianae, P. erythroseptica* var. *jatrophae* is included in *P. erythroseptica*, and *P. hydrophila* [ibid., ix, p. 809] is united with *P. capsici.*

A key is given for the identification of the species and a bibliography of 240 titles is appended.

BLACKWELL (ELSIE M.) & WATERHOUSE (GRACE M.). **Spores and spore germination in the genus Phytophthora.**—*Trans. Brit. Mycol. Soc.*, xv, 3–4, pp. 294–310, 7 figs., 1931.

In giving a summarized account, based on their own work and on a review of the relevant literature, of the origin, development, and germination of the various types of sporangia, conidia, chlamydospores, and sphaeroconidia in species of *Phytophthora*, the authors state that apparently no precise distinction can be drawn between these types. Neither the method of germination nor the shape and size of the spore serve as an absolute criterion of any of the spore-types, the method of germination varying by degrees from zoospore emission to germination by a tube. In *P. parasitica*, for instance, the authors found every transitional stage between the obpiriform sporangia and the spherical chlamydospores. Sphaeroconidia develop in old cultures, on stouter hyphae than the ordinary conidia or sporangia, and give rise to several hyphae which may develop into a vegetative mycelium or give secondary spores. Resting conidia are formed in the same way as ordinary conidia but their germination is delayed and they accumulate fatty reserves, eventually putting out a germ-tube. The chlamydospores have thickened and sometimes coloured walls and the germ-tube emerges through a pore, but the distinction between the resting conidia and chlamydospores is often slight and the former may also sometimes germinate through a germ-pore. There is no evidence that conidia produced under certain determined conditions will always germinate by any given method,

but the stage of maturation of the spores plays an important part in determining the type of germination. Once the fungus is of an age and in a state to produce spores, production can be hastened or delayed, and once the spore is initiated and the maturation processes have set in, these can be accelerated or retarded by external factors, e.g. temperature.

WATERHOUSE (GRACE M.). **The production of conidia in the genus Phytophthora.**—*Trans. Brit. Mycol. Soc.*, xv, 3–4, pp. 311–321, 1931.

A brief description is given of experiments with *Phytophthora cactorum*, *P. cryptogea*, *P. fagi*, *P. colocasiae*, *P. palmivora*, and *P. parasitica*, to determine the influence of external factors on the production of conidia in this genus. The limiting factors were found to be temperature, humidity, and the supply of air, of which the last two inhibited the production of conidia at the lower limit only. Excess of water more than doubled the number of conidia. The production was also shown to be dependent on the nature of the culture medium, probably in relation to its moisture content. Presence or absence of light did not appear to cause any great variations in some species. All these factors exert a considerable influence on the time that is required for the formation of conidia after inoculation. The number of conidia per unit area of culture surface depends on the density of mycelial branching.

CIFERRI (R.). **Smuts collected in the Dominican Republic by E. L. Ekman. I.**—*Arkiv för Bot.*, xxiii A, 4, No. 14, pp. 1–29, 3 pl., 2 graphs, 1931.

A list, supplemented by critical and taxonomic observations, is given of 33 Ustilaginales collected by E. L. Ekman (alone or in company with the author) in the Dominican Republic during 1929–30 [cf. *R.A.M.*, x, p. 625]. The comparative incidence of the smuts in the Dominican Republic and Porto Rico [cf. ibid., v, p. 700] is shown by means of a table. *Ustilago euchlaenae* was found attacking the unopened inflorescences of cultivated teosinte (*Euchlaena mexicana*) and causing total abortion.

JACKSON (H. S.). **The rusts of South America based on the Holway collections. III.**—*Mycologia*, xxiii, 2, pp. 96–116, 1 pl., 5 figs., 1931.

In this paper, which is the third of a series having the same title [cf. *R.A.M.*, vi, p. 319], the author enumerates with notes 26 South American rusts occurring on members of the families Berberidaceae, Lauraceae, Capparidaceae, Saxifragaceae, Rosaceae, and on the genus *Rubus*.

TIUKOW (D.). **Beitrag zur Einteilung der Schimmelpilze aus der Gattung Penicillium nach physiologischen Eigenschaften.** [Contribution to the classification of the moulds of the genus *Penicillium* according to physiological properties.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxiii, 23–26, pp. 385–395, 1931.

The writer discusses and tabulates the results of his investigations on the classification of moulds of the genus *Penicillium*

according to their varying reaction towards carbohydrates (represented by cane sugar). Under this system three groups are distinguished, viz., species which form starch or starch-like bodies in their hyphae, species which cause organic acids to accumulate in the medium and give no reaction for starch, and species neither forming starch nor accumulating acid.

RUDOLPH (B. A.). **Verticillium hadromycosis.**—*Hilgardia*, v, 9, pp. 197–353, 4 pl., 7 figs., 1931.

This is an extensive study [based on a review of the relevant American and European literature up to the beginning of 1929 and on the author's personal investigations in California] of that part of the 'hadromycosis' group of plant diseases [*R.A.M.*, vii, p. 179; ix, p. 67], which is specifically caused by *Verticillium albo-atrum* and related forms [cf. ibid., x, p. 149]. These diseases are stated to cause considerable damage to economic and ornamental plants in the coastal counties of California, where they are referred to popularly as 'wilt' in truck crops, 'blue stem' in bush fruit, and 'black heart' in stone fruit trees, in accordance with the symptoms produced.

In susceptible annuals such as the tomato, potato, and the like, an attack of the disease is usually fatal, while perennials, such as fruit and forest trees, particularly when young, may be killed or may recover, depending on the severity of the infection. Hitherto over 130 different species [a list of which is appended], belonging to 35 widely unrelated families and eighteen orders, have been reported in various countries as susceptible to the disease. It is pointed out, however, that the susceptibility of certain species, e.g., cacao, tobacco, coffee, cassava, banana, French beans, and *Thuja* spp., needs further confirmation. A fuller discussion of the disease is given in 94 species of economic and ornamental plants, trees, and weeds, with particular reference to the potato and tomato, and with a full indication of the relevant literature in each case.

In view of the cultural similarity of the author's isolations from many hosts, cross-inoculations were undertaken on myrobolan [*Prunus divaricata*] seedlings, and raspberry and tomato plants as representative of the three main groups attacked. The results of several years' experimentation have conclusively shown that the disease is readily intercommunicable between these groups. The strain of *Verticillium* which attacks and kills the tomato in California also readily attacks the apricot. This fact is of considerable economic importance in that State, since young apricot orchards there are frequently interplanted with tomatoes. The latter were shown by the investigation to have a very low resistance, and to play a very important part in the propagation and dissemination of the fungus in the soil. It was further proved that the disease also attacks some of the commonest weeds, such as the mallow (*Malva* spp.), rough pigweed (*Amaranthus retroflexus*), bur clover (*Medicago hispida*), dandelion (*Taraxacum officinale*), and groundsel (*Senecio vulgaris*).

In discussing the taxonomic position of the species of *Verticillium* associated with 'hadromycosis', it is stated that in most

instances the claims of these organisms to specific rank are very doubtful, being based on very slight morphological differences, frequently derived from cultures on artificial media, on which the morphological details and growth characters of the fungi are dependent on the substratum. Continued cultivation on artificial media brings about pronounced morphological changes in *V. albo-atrum*. His own work, and a careful examination of the relevant literature, lead the author to consider that at present it would not be prudent to attempt to re-classify any of these organisms on the basis of the existing descriptions, but the balance of evidence tends to show that most are merely varieties of *V. albo-atrum*. The most conspicuous instance of this is *V. dahliae* Klebahn [in regard to which the author follows much the same line of reasoning as Wollenweber: ibid., ix, p. 6; cf. also ix, p. 728]; in all probability this also apples to *V. tracheiphilum* [ibid., x, p. 150] and *Acrostalagmus vilmorinii* Guéguen.

The bibliography appended comprises 329 titles, besides many more references in the form of footnotes.

MITRA (M.). **A comparative study of species and strains of Helminthosporium on certain Indian cultivated crops.**—*Trans. Brit. Mycol. Soc.*, xv, 3–4, pp. 254–293, 1 pl., 10 figs., 3 graphs, 1931.

A detailed account is given of the author's comparative studies in pure culture and in cross-inoculation experiments of seven forms of *Helminthosporium* isolated from cultivated gramineous hosts and one from ginger (*Zingiber officinale*) in India, and also of their morphology under natural conditions and of the symptoms caused by them [*R.A.M.*, x, p. 437]. These forms are referred to the following species, two of which are new, and one a new variety. *H. sativum* was found both on wheat and barley leaves at Pusa. *H. bicolor* n. sp. was isolated from wheat showing foot rot in Poona. It is characterized by conidiophores of the *H. sativum* type, but dark greyish-brown, and typically cylindrical conidia with abruptly rounded ends, sometimes slightly broader in the middle, straight or slightly curved, 1- to 9-septate (average 5), greyish to dark greyish-smoky-brown (sometimes quite opaque), the two end cells being lighter, sometimes subhyaline; their extreme measurements are 16·5 to 79 by 10 to 20 μ (mean 51 by 14 μ). *H. halodes* var. *trictici* n. var. was associated with foot rot of wheat in the Central Provinces. Its conidiophores are similar to those of the type species but the conidia differ in size and septation. These conidia are cylindrical or elliptical with the distal end abruptly rounded and the proximal end tending to taper to an acute base; the basal cell is thus somewhat triangular and at its end has a prominent hilum. The spores are widest near the middle, straight or slightly curved, 2- to 9-septate (average 6), light greenish-brown to brown or smoky-brown, the two end cells being slightly lighter; their extreme measurements are 23 to 73 by 13 to 20 μ (mean 52 by 16·5 μ).

H. frumentacei n. sp. is stated to occur every year on the leaves and leaf sheaths of *Panicum frumentaceum* in the neighbourhood of Pusa, causing considerable damage to the affected plants. It forms

very numerous yellowish, dot-like discolorations, 1 to 2 mm. in diameter, on both sides of the leaves and on the leaf sheaths. These spots gradually increase in size and show a light brownish centre (dark brown to chocolate when old) with a yellow margin; they extend longitudinally along the veins, which they often cross, and by coalescing form long stripes. The conidiophores are of the *H. sativum* type, 62 to 263 by 4·5 to 7·5 μ, and brown to dark brown. The conidia are typically fusoid, straight or slightly curved, with a rounded distal end and tapering to an acuminate base with a prominent hilum, thin walled, yellowish to light olivaceous or light brown, 3- to 11-septate (average 7), and measure 49 to 158 by 10 to 18·5 μ (average 110 by 15 μ).

The form on ginger was found to be referable to *H. maydis* [ibid., ix, p. 765], but may be a different strain from that occurring on maize. The disease first appears on this host during the rainy season in the form of small oval spots, 4 to 5 by 2 to 3 mm. in diameter, scattered over both surfaces of the leaves. After the rains the spots develop rapidly, and show a brownish centre and a diffuse yellowish margin; the mature spot consists of a central dead, straw-coloured area surrounded by a brown ring, outside which is the yellowish zone.

H. sacchari was isolated at Pusa from sugar-cane leaves, on which its morphology in general agreed with that of *H. sativum*, with the exception that in the invaded areas it filled certain epidermal cells with interwoven mycelium forming stromatic masses, and that it formed creeping brown hyphae on the surface of the leaves. In these two respects the sugar-cane fungus differs from the forms described above and agrees with the next-mentioned. Its conidiophores, which are of a deep greenish-brown with paler tips and measure 70 to 200 by 5·5 to 7·5 μ, arise from the stromatic masses or from the creeping hyphae mentioned above. The full range of variability in the measurements of the conidia was found to be 32 to 120 by 11 to 17 μ. Finally, *H. oryzae* [ibid., x, p. 55] was isolated from the leaves and ears of rice at Pusa.

In describing the cultural characters of these fungi on various artificial media, it is stated that certain microscopic characters show a greater degree of constancy than macroscopic features of growth. Although the amount of sporulation and spore measurements vary within wide limits, the shape and colour of the spores are markedly constant, and are therefore significant in the delimitation of species. Cross-inoculations showed that while each fungus freely parasitizes the host plant from which it was isolated, under experimental conditions most of them are able to attack a number of other hosts, and that with the exception of *H. frumentacei* and the strain from ginger referred to *H. maydis*, all of them are capable of causing foot rot in wheat and barley.

GADD (C. H.). **Report of the Mycologist.**—*Tea Res. Inst. Ceylon Bull.* 5 (*Ann. Rept. for the year 1930*), pp. 12–16, 1931.

During the period under review *Poria hypolateritia* [*R.A.M.*, viii, p. 469] continued to be the most prevalent root disease of tea in Ceylon, mainly owing to the difficulty of eliminating the

fungus from the soil. The removal of dead bushes is insufficient; infected bushes on the perimeter of the affected area must also be removed before they develop any symptoms above ground. This necessitates examining the root systems at the time the dead bushes are dug out. To wait until the bushes are dying before so doing is false economy, as by that time the fungus has passed to the roots of adjacent bushes.

The recognition that the so-called *Diplodia* root disease [ibid., ix, p. 746] results from a deficiency of internal food reserves at the time of pruning and not from attack by pathogenic organisms has greatly reduced the losses attributable to the disease. At the lower elevations a lighter type of pruning is now being practised which leaves plenty of green leaf on the bush.

Macrophoma theicola [ibid., viii, p. 470] commonly attacks tea stems about half an inch in diameter, killing small areas of the bark an inch or so long and causing cankers. Similar cankers were found on the larger branches of seed bearers, *Desmotascus neglectus* being associated with them. This fungus is regarded by Petch as the perfect stage of *M. theicola.* The similarity of the cankers lends support to the view that both are forms of the same fungus.

Red rust (*Cephaleuros parasiticus*) [loc. cit.] was reported from a number of estates in the low-lying country. The fungus becomes of serious importance only when the bushes are weakened through poor drainage and the like.

The view expressed in a previous report [ibid., v, p. 582] that 'witches' broom' of tea in Ceylon really included a number of diseases with similar symptoms but resulting from different, though obscure, causes is now supported by observations made during the period under review. At least one form of the disease spreads slowly from bush to bush, possibly disseminated by the pruning knife. This type of the disease may belong to the virus group.

A root disease of *Acacia decurrens* was reported from two estates in different districts, due, apparently, to a species of *Aglaospora* quite distinct from *A. aculeata* causing a stem disease of tea.

STEINMANN (A.). **Een nieuwe bladschimmel op Thee in Nederlandsch-Indië.** [A new leaf fungus on Tea in the Dutch East Indies.]—*De Bergcultures*, v, 25, pp. 678–680, 4 figs., 1931.

Asterina camelliae, originally described by Sydow and Butler from Assam, has recently been detected forming black crusts on the leaves of tea in Sumatra. In all probability the fungus was introduced with consignments of tea seed from Assam, whence seed is chiefly obtained. The dark brown hyphae constituting the crusts are septate, 8 to 12 μ in width, with irregularly thickened walls, along which spherical to oval hyphopodia occur at intervals. The scutiform perithecia, measuring 0·2 to 0·3 mm. in diameter contain asci with eight brown, uniseptate ascospores, slightly constricted at the median wall. The fungus penetrates the surface cells by means of short hyphal branches and must therefore rank

as a parasite. *A. camelliae* in Sumatra is liable to be parasitized by the fungus *Dimerium wattii*, which was also found on the original material collected by Watt in 1895.

NELSON (N. T.), MAJOR (T. G.), & MACRAE (N. A.). **Tobacco Division Report for the year 1930.**—Issued by the *Canada Dept. of Agric.*, 26 pp., 1 fig., 1931.

On pages 20–21 of this report [which is compiled on the same lines as the previous one: *R.A.M.*, x, p. 131] brief notes are given on the prevalence of tobacco diseases in Canada in 1930, namely, black root rot (*Thielavia basicola*), damping-off (*Pythium de Baryanum*), seed-bed mould (*Pyronema confluens*) [ibid., iv, p. 194], hollow stalk (*Bacillus carotovorus*), wildfire (*Bacterium tabacum*), angular leaf spot (*Bact. angulatum*), mosaic, frenching, curly dwarf, leaf drop, sand drown (magnesium deficiency), and brown root rot, a few distinct cases of which were found in Essex county, Ontario [ibid., x, p. 134].

VINSON (C. G.) & PETRE (A. W.), **Mosaic disease of Tobacco. II. Activity of the virus precipitated by lead acetate.**—*Contrib. Boyce Thompson Inst.*, iii, 1, pp. 131–145, 1931.

Full details are given of a new method devised by the authors for the precipitation from solution of the virus of tobacco mosaic by means of a solution of lead acetate, since the safranin precipitate method [*R.A.M.*, viii, p. 407] was found not to be favourable for the isolation of a product free from pigment. The virus is released from the lead precipitate upon suspending the latter in a M/15 solution of potassium phosphate of about P_H 6·5. It is recommended, however, first to treat the precipitate with a normal solution of primary potassium ortho-phosphate, which removes irrelevant organic matter, but does not remove an appreciable amount of the virus. In this way virus solutions have been obtained which were equal in infective power to the original juice, while containing only about 1 per cent. of the total solids in the original juice sample.

Crystals uniform in appearance were obtained from the solution of the acetone precipitate. These crystals are moderately active, and much of their activity is retained on recrystallization. The ash content of these crystals was high as compared with that of more highly active virus preparations.

HOPKINS (J. C. F.). **A Phytophthora from Antirrhinum causing a stem rot of Tobacco.**—*Proc. Rhodesia Scient. Assoc. 1930–1931*, xxx, pp. 49–52, 1931.

Isolations from the diseased tissues of a cultivated snapdragon plant (*Antirrhinum* sp.) exhibiting a collar rot and general wilt (a disease which is stated to be very prevalent throughout Rhodesia during the rainy season) yielded a species of *Phytophthora* morphologically different from *P. pini* var. *antirrhini* described from the same host in India [*R.A.M.*, viii, p. 243]. In old cultures on potato dextrose agar the fungus produced a profusion of spherical chlamydospores with thick, yellow walls, measuring 21 to 39 μ in diameter. No sexual bodies were seen, but the general characters of the

fungus suggested that it may be referred to *P. parasitica* Dastur as emended by Ashby [ibid., vii, p. 601], this being, as far as the author is aware, the first record of a member of this group on *Antirrhinum* spp.

Inoculation experiments [details of which are given] showed that the *Antirrhinum* fungus is capable of producing a stem rot and wilt on wounded or uninjured tobacco plants, the roots of which are kept in a waterlogged condition. Some of the infected plants showed depressed brown lesions on the stem, extending as much as nine inches above soil level, and a rot which penetrated to the pith, entirely disintegrating the latter and leaving a hollow cylinder with small portions of brown, rotted tissue. The internal rot did not progress farther up the stem than the limit of visible infection on the exterior. The woody cylinder itself was light brown with dark brown streaks due to the deposition of a gummy substance in the xylem vessels. When fragments of the inoculated pith were incubated in water, large papillate sporangia, 32 to 52 by 29 to 41 μ (length: breadth 1·3), were formed and readily liberated zoospores.

The fungus was not proved to occur on tobacco in nature in Rhodesia, but a species resembling it (which could not be isolated) has been encountered on this host, causing a similar stem rot on plants in waterlogged soil.

DORAN (W. L.). **Increasing soil acidity as a means of controlling black root rot of Tobacco.**—*Massachusetts Agric. Exper. Stat. Bull.* 276, pp. 118–146, 2 pl., 1931.

A full account, accompanied by tables, is given of the writer's experiments in Massachusetts on the effects of acids and sulphur in lowering the P_H values of soil, on the growth of tobacco, and on the incidence of black root rot (*Thielavia basicola*) [*R.A.M.*, x, p. 437].

When the P_H value of the soil was reduced by the application of sulphuric or nitric acids, infection by black root rot was correspondingly lessened. It is suggested that the failure of acidification by ortho-phosphoric acid (alone) to reduce the disease may be due to inactivation by it of toxic aluminium salts which inhibit the development of *T. basicola* in the soil. An application of aluminium sulphate to the soil was found to diminish the injury caused by this fungus.

The soil P_H values in field plots last receiving lime in 1923 were still high enough (above 5·9) in 1930 to be favourable to *T. basicola*. Loss in yield of tobacco, caused directly by black root rot and indirectly by lime reached its maximum (44 per cent.) in 1925 and 1926 and decreased in 1929 and 1930 to 24 per cent. Tobacco and lucerne crops were equally efficient, and much more so than timothy [*Phleum pratense*], in removing calcium and magnesium oxides from limed soil, but with no sulphur or acids applied none of these crops caused a reduction of the P_H value of the soil between 1926 and 1930. *T. basicola* did not infect lucerne grown in limed soil infested by the fungus, and as far as black root rot is concerned, there seems to be no reason for avoiding this crop in a rotation preceding tobacco. Lucerne and alsike clover [*Trifolium hybri-*

dum] were much less injurious in promoting brown root rot in a subsequent crop of tobacco than timothy [ibid., x, p. 134], following which the disease was equally severe both on limed and unlimed plots.

Sulphur (400 lb. per acre) applied for two years in succession reduced the severity of the disease in these and the three following years. Yields of tobacco on limed plots infested by *T. basicola* were increased by all acidification treatments, including sulphur at varying rates and sulphuric acid + ortho-phosphoric acid (1,800 and 440 lb. per acre, respectively), in the year of application. With sulphur the increase was greater in the year following application than in the same season, and the optimum rate of application was found to be nearer 400 than 800 lb. per acre: probably the former is the maximum consistent with safety on limed plots. Increased yields from some of the treatments have continued up to 1930. Such increases were usually accompanied by a higher percentage of leaves belonging to the grades known as 'lights', 'mediums', and 'seconds', as contrasted with 'darks' and 'fillers'.

TISDALE (W. B.) & WADKINS (R. F.). **Brown spot of Tobacco caused by Alternaria longipes (E. & E.), n.comb.**—*Phytopath.*, xxi, 6, pp. 641–660, 5 figs., 1931.

A leaf spot disease of bright or flue-cured tobacco, commonly known as brown spot, has been prevalent for some years in the Florida and Georgia tobacco sections. It is believed to be similar to, if not the same as the disease reported by Ellis and Everhart from North Carolina in 1892 (*Journ. Mycol.*, vii, p. 130). Although it cannot be ranked among the diseases of major importance, brown spot may, when the seasonal conditions favour its development, cause a considerable reduction both in the quantity and quality of the crop. The spots appear first on the lower leaves and enlarge rapidly, often coalescing and rendering the entire leaf area worthless; the upper leaves and, in severe cases, the stalks afterwards become infected. The lesions are circular, water-soaked at first, later assuming blended tints of green to brown; in damp weather they may be surrounded by a halo. Under favourable conditions the spots attain a diameter of 1·5 to 2·5 cm. and may show a faint target-board effect or concentric rings. On the petiole the lesions are elongated and depressed, developing more slowly than those on the leaf blade, while the spots on the stalk are sunken and may finally girdle the stem. Observations indicate that tobacco is the only plant amongst those occurring naturally in the tobacco fields susceptible to infection by brown spot, and artificial inoculations on potato, tomato, and pepper [*Capsicum annuum*] failed. The disease appears to attack the different commercial varieties with approximately equal severity.

A species of *Alternaria*, producing catenulate spores of approximately equal dimensions to those given for *Macrosporium longipes* E. & E. (30 to 50 by 10 to 13 compared with 40 to 50 by 15 to 20 μ given by Ellis and Everhart), was isolated from diseased material. The spots produced by the Florida fungus are similar to those described as resulting from *M. longipes*. The two are therefore regarded as identical, but on account of the catenulate spore

formation in the newly observed organism the name *Alternaria longipes* (E. & E.) n. comb. is proposed [but see *A. longipes* (Ell. & Ev.) Mason, 1928: *R.A.M.*, viii, p. 404].

A. longipes hibernates on the stalks left standing in the fields or lying on the surface of the ground. Proof of its pathogenicity has been established by numerous inoculation experiments on Connecticut Round Tip tobacco plants. The fungus penetrates the epidermal cells directly and through the stomata, wounding being unnecessary for infection. The minimum temperature for infection was found to be about 20° to 22° C.; moderate infection occurred at 23° to 25° and severe at and above 26·5°. On culture media the optimum temperature for the development of *A. longipes* was between 25° and 28° with a maximum about 34° or 35°. The maximum amount of growth on potato-dextrose agar occurred at P_H 5·5; distinct zonation was observed on this medium. There was a slight decline in growth at P_H 6 and 6·5, with another increase at P_H 7 and 7·5.

Control measures should include the cutting and turning under of the stalks immediately after harvest, suitable manuring, crop rotation, frequent cultivation, and the pruning of the leaves at a proper stage of maturity.

KLEBAHN (H.). **Die Stammfäule der Tomaten.** [The stem rot of Tomatoes.]—*Die Kranke Pflanze*, viii, 6–7, pp. 93–96, 1931.

No conclusive results can yet be drawn from the writer's recent experiments (1928–30) in the Hamburg district on the control of *Didymella lycopersici* on tomatoes [*R.A.M.*, x, p. 631] by the following methods: (1) disinfection of the soil 4 weeks before planting with 40 per cent. formaldehyde ($\frac{1}{4}$ l. in 10 l. water); (2) packing peat mould round the stem bases of the seedlings 14 days after planting; (3) three applications of Bordeaux mixture during the summer; and (4) painting the lower parts of the stems with 10 per cent. Bordeaux mixture. Sufficiently encouraging progress has been made, however, to justify further trials. Soil disinfection with carbolineum proved unsatisfactory.

REUSRATH (G.). **Betrachtungen über die Braunfleckenkrankheit der Tomaten.** [Observations on Tomato leaf mould.]—*Gartenwelt*, xxxv, 26, p. 354, 1931.

Referring to the immense damage caused in Germany by leaf mould of tomatoes (*Cladosporium fulvum*) [*R.A.M.*, x, p. 631], some popular notes are given on the best means of prevention in glasshouses by proper management of the house, especially as regards temperature, ventilation, and watering, and by liberal applications of potash fertilizers.

GUINIER (P.). **Balais de sorcières et tumeurs des végétaux ligneux.** [Witches' brooms and tumours of woody plants.]—*Conf. Labor. Microbiol. Fac. Pharm. Nancy, 1930*, pp. 161–181. [? 1930. Abs. in *Zeitschr. für Krebsforsch.* (Referatenteil), xxxiv, 2–3, p. 40, 1931.]

The author compares the witches' brooms produced on *Abies* by *Melampsorella caryophyllacearum* [*R.A.M.*, ix, p. 420] with the

woody tumours developing on the stems from the same cause. Both malformations develop after the infection of the embryonal cells of the primitive meristem or the cambium. According to the virulence of the parasite the woody tumours heal over or lead to necrosis of the host tissue. A summary is given of present knowledge of the etiology of witches' brooms derived from a study of the relevant literature. The application of the terminology of human diseases (especially cancer) to phytopathological phenomena is deprecated as apt to obscure the differences in animal and plant organization.

EMERY. **Origine bactérienne des tumeurs de l'Orme.** [Bacterial origin of the tumours on the Elm.]—*Comptes rendus Acad. des Sciences*, cxciii, 1, pp. 76–77, 1931.

The author claims to have isolated [by a method briefly indicated] a virulent culture of *Bacterium tumefaciens* from the subcortical tissues of a woody tumour of the well-known type, sometimes called ' loupes ', on an elm tree [species not given] in France. This organism, when inoculated into a young elm tree, caused the formation of two galls at the points inoculated, one at the collar and the other higher up the stem. After remaining dormant during the winter, the following spring the tumours resumed their growth and doubled their size. The infected tree was slowed down in its growth, as compared with a control, and has developed numerous small galls at its base, which at the time of the report were showing signs of further development. In the author's opinion these observations establish the bacterial origin of the elm galls, the true nature of which was not known hitherto.

HOLTTUM (R. E.). **Annual Report of the Director of Gardens, Straits Settlements, for the year 1930.**—10 pp., 1931.

The following items of phytopathological interest occur in this report. In the course of a visit to Negri Sembilan E. J. H. Corner frequently observed *Fomes setulosus* Petch [*R.A.M.*, vii, p. 704] parasitic on large dipterocarp trees, while *F. pachyphloeus* [ibid. viii, p. 292] was found on *Dialium* sp. in three localities. *F. setulosus* and *Ganoderma* sp. were found attacking large jungle trees in Tembeling, where *F. pachyphloeus* was observed as a parasite of *Ficus* sp., *Fomes pectinatus* [ibid., iv, p. 75] of *Irvingia malayana*, and *G. applanatum* of a rubber tree injured by floods.

HATFIELD (I.). **Recent experiments with chemicals suggested for wood preservation.**—*Proc. Amer. Wood Preservers' Assoc. 1931*, pp. 304–315, 1 graph, 1931.

In giving details of experiments to test the toxicity to lignicolous fungi of certain chemicals submitted to the United States Office of Forest Pathology as possible wood-preserving substances, the author points out that the methods used in this work differ somewhat from those which have been agreed upon at the 1929 Toximetric Conference at St. Louis [*R.A.M.*, x, p. 217]. The tests were made on agar cultures of *Fomes annosus*, *Lenzites trabea*, *Poria incrassata*, *Ceratostomella pini*, and *C. pilifera*. For facility of presentation the chemicals tested are divided into four groups,

the first consisting of six proprietary substances from E. I. du Pont de Nemours & Co., the second including a number of German preparations, the third containing four benzene derivatives submitted by the Dow Chemical Company, and the fourth consisting of a few miscellaneous chemicals.

The results [which are presented in tables and in a graph to show the highest concentration that inhibited growth without killing the fungus and the lowest concentration that killed it] indicated that in group I the ethyl mercuries proved most effective against both the wood-destroying and the wood-staining organisms, the toxicity for both types ranging between 0·015 and 0·03 per cent. In group II sodium dinitrophenolate was superior to any of the other preparations for killing *F. annosus*, and probably also the blue-staining fungi. The chemicals included in this group had already been tested by Liese in Germany [ibid., x, p. 572] for their action on *Coniophora cerebella* and *Polyporus vaporarius* [*Poria vaporaria*], which were also included in the author's tests; the results showed that a higher concentration of the toxic material was required in every case to kill *F. annosus* than was required to kill the European fungi. All the benzene derivatives in group III showed a fair degree of toxicity, but tetrachlorophenol was better than the others. Of the miscellaneous chemicals of group IV, minerec (a mixture of 10 per cent. xanthic anhydride and 90 per cent. ethyl-oxycarbonyl sulphide) and butyl phenolate showed the greatest toxicity. It is pointed out that in most cases a higher concentration of chemical was required to kill the blue-staining than the wood-destroying fungi.

NEILL (J. C.) & BRIEN (R. M.). **A method to obtain dry-rot-infected Swede seed.**—*New Zealand Journ. of Agric.*, xlii, 6, p. 433, 1931.

The authors state that the fact that swede seeds produced even from a crop in which practically every plant bore dry rot (*Phoma lingam*) lesions [*R.A.M.*, ix, p. 755; x, pp. 151, 584] usually exhibit a very low percentage of infection with the organism has hitherto greatly hampered experimental work on seed disinfection from this disease. To obviate this difficulty, a method was devised at the Plant Research Station, Palmerston North, New Zealand, in which spore suspensions of *P. lingam*, strained through a cheese-cloth, were injected by means of a hypodermic syringe into the almost fully developed, but still green and fleshy, seed pods. Of the two strains of the fungus used in the experiments, one is stated to have given an average of 26 per cent., and the other of 16·4 per cent. infected seed, after the pods had been allowed to ripen and were threshed in the usual manner.

BRINKMAN (A.). **De roodneuzen-ziekte van Phaseolus vulgaris L., veroorzaakte door Pleospora herbarum (Pers.) Rbh.** [The red nose disease of *Phaseolus vulgaris* L. caused by *Pleospora herbarum* (Pers.) Rbh.]—*Thesis, Univ. of Amsterdam,* 86 pp., 4 pl., 1 fig., Baarn, Hollandia-Drukkerij, 1931.

A full account is given of the writer's investigations on the so-called 'red nose' disease of beans (*Phaseolus vulgaris*) caused by

Pleospora herbarum (*Macrosporium commune*) [*M. sarcinula*] in Holland [*R.A.M.*, x, pp. 327, 430]. The seeds of affected plants show a pink discoloration which nearly always centres round the micropyle. *P. herbarum* was isolated from practically all the sterilized beans examined, but in one sample *Alternaria circinans* [ibid., vii, p. 412] and *A. tenuis* developed. Bacteria were also frequently present in the discoloured beans.

Inoculation experiments with the three above-mentioned fungi on various organs of bean plants failed to induce any external symptoms except when the pods were inoculated with *P. herbarum*, in which case infection of the seed occurred through the funicle. Seeds inoculated with *P. herbarum* developed purple spots, often surrounded by a yellow border. *A. circinans* also caused seed infection, producing reddish-brown spots. Inoculation experiments with *A. tenuis* gave negative results except on seeds still in the pod, on which a reddish-brown spot developed, similar to that produced by *A. circinans*. It would appear from the author's experiments that *P. herbarum* is a stronger parasite than *A. circinans*.

When seeds from 'red nose' beans are planted out many fail to germinate. Some of the resulting seedlings are killed by infection of the cotyledons, but a considerable number of the plants outgrow the attack and show no further external symptoms.

P. herbarum can only be induced with difficulty to form conidia, but the development of these organs took place on various media under the influence of ultra-violet rays [cf. ibid., x, p. 483] and of sunlight. Perithecia are formed in profusion on various media.

Positive results were given by inoculation tests with pure cultures of *P. herbarum* isolated from beans on tomato, cucumber, and onion, but not on clover and potato.

The systematic position of the genera *Macrosporium* and *Alternaria* is discussed with reference to the prevailing confusion between them [ibid., iv, p. 61; viii, p. 404]. There are, however, marked differences between the two genera. For instance, *Macrosporium* hardly ever forms conidial chains, which are an almost constant feature of *Alternaria*. The *Macrosporium* conidia, moreover, are blunted at both ends, while those of *Alternaria* are more or less sharply pointed and some are furnished with beaks. The *Alternaria* conidia become lateral because the conidiophores grow out laterally below those first formed and push them over to one side, whereas in *Macrosporium* the continued growth of the conidiophores must be preceded by the falling off of the conidia, which are thus never found in a lateral position. The perfect stage of *Alternaria* has not yet been found but is known in the case of various species of *Macrosporium*. *M. tomato* [ibid., ix, p. 228] should, in the writer's opinion, be referred to *Alternaria*.

A four-page bibliography is appended.

FISCHER (R.). **Zur Bekämpfung des Wurzelbrandes der Zuckerrübe.** [On the control of root rot of the Sugar Beet.]—*Nachricht. über Schädlingsbekämpf.*, vi, 2, pp. 33–35, 1931.

In this paper [which is reprinted from the *Wiener Landw. Zeit.*,

18th April, 1931] the writer gives some popular notes on the occurrence and control of root rot of sugar beet in Austria. The fungi chiefly involved in the causation of the disease are *Pythium de Baryanum* and *Phoma betae*, while *Aphanomyces levis* and *Rheosporangium* [*Pythium*] *aphanidermatum* [cf. *R.A.M.*, x, p. 342] are represented to a lesser extent. In addition to cultural measures (including the application of a complete fertilizer), ten minutes' dusting of the seed-clusters with ceresan (25 gm. per 3 kg.) gave good control of root rot in a test conducted by the Federal Institute for Plant Protection, the average yield of the treated plots being $304 \pm 12{\cdot}9$ kg. compared with $262 \pm 13{\cdot}9$ kg. for the checks [see next abstract].

OBERDORFER. **Trockenbeizversuche gegen Wurzelbrand der Zucker- und Futterrübe.** [Dusting experiments against root rot of the Sugar and Fodder Beet.]—*Nachricht. über Schädlingsbekämpf.*, vi, 2, pp. 36–37, 1931.

In 1930 the writer repeated his tests on the control of root rot of beets [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] in Saxony by dusting with ceresan and tillantin [*R.A.M.*, ix, p. 574 and preceding abstract], using fodder instead of sugar beets. Ceresan reduced the incidence of infection from 67 to 37 per cent. (average for the two years from 78·5 to 44·75 per cent.), the reduction with tillantin being to 55 (57·15). In both years the root systems of the plants treated with ceresan were particularly vigorous and copiously branched.

NUCKOLS (S. B.). **Effects of 'black root' in Beets.**—*Facts about Sugar*, xxvi, 6, pp. 260–262, 264, 2 figs., 1931.

The results [which are tabulated and discussed] of comparative statistical analyses of healthy sugar beets and those suffering from black root [? *Phoma betae* and other organisms: *R.A.M.*, vi, p. 709; viii, p. 542; x, p. 576] in the United States showed that 59 per cent. of the latter died. The average yield produced by the diseased beets was markedly lower than that of the normal plants, and the somewhat higher sucrose and apparent purity coefficient values of the infected individuals failed to compensate for their low average weights (16·60 compared with 28·97 oz.). It is important to remove at thinning time all abnormally small plants with blackened roots and bowed petioles.

FRON (G.) & MONCHOT (E.). **Une maladie des Épinards en 1930.** [A disease of Spinach in 1930.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 45–53, 4 figs., 1931.

In November, 1930, the authors' attention was directed to a disease of spinach growing on a waterlogged clay soil in the vicinity of Paris [cf. *R.A.M.*, x, p. 499]. The leaves were yellow and drooping and when the plants were lifted in many cases the rotted tip of the tap-root remained in the ground. Less severely affected roots showed a healthy zone at the collar, and below this a greyish band, succeeded by another apparently healthy ring, below which was a further greyish area which became black near the rotted end of the root. On cutting the root longitudinally the

deep tissues under the grey zones were found to be diseased, and this diseased area, surrounding the central cylinder, extended up to the base of the petioles, though in the upper part the root and collar appeared externally healthy. Non-septate, inter- and intracellular hyphae, 5 to 6 μ in diameter, were present in the cortical parenchyma. In culture the fungus grew abundantly on numerous neutral or slightly acid media and formed terminal sporangia, though zoospore formation was not noted. Oogonia containing oospores usually measuring between 28 and 36 μ developed in the host and in culture, those formed in the root having an average diameter of 34 μ. The authors refer the fungus, provisionally at least, to *Pythium de Baryanum* [ibid., viii, p. 187, but see next abstract].

FOËX (E.). **Une maladie des Épinards. I. Étude générale.** [A disease of Spinach. I. General study.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 54–65, 1 pl. [facing p. 80], 10 figs., 1931.

An account is given of a disease of spinach first reported in France in 1913 and observed by the author in the department of Seine-et-Oise as well as in other localities during 1930. The condition is most frequent in autumn on spinach sown between the middle and end of August [cf. preceding abstract]; affected plants show small, narrow, light green or yellow leaves (sometimes restricted to the middle of the plant), which are also often thick, stiff and brittle, with sinuous edges and a puckered or bullate surface. Diseased plants are generally checked in their growth. Frequently the leaf blades gradually dry up from the edges inwards. The collar and tap-root appear to remain healthy for some time, but even in early stages of the disease a longitudinal section reveals a yellowish-grey discoloration beneath the point of insertion of the leaves; as a rule this is not noticeable in the tap-root until after the leaves have completely withered. Under conditions of great humidity the plants do not wither but develop a wet rot.

Diseased plants are occasionally found among healthy ones but more often they are in groups, as if the disease had spread from an initial centre of infection.

Sections of diseased leaves showed the presence (in tissues with cellulose walls and more rarely in contact with the vascular elements) of a non-septate inter- and intracellular mycelium, the shape and diameter of the hyphae varying with the amount of mechanical resistance they encountered; the intracellular hyphae were constricted only where they passed through the cell walls. The organism was identified by Labrousse as *Pythium ultimum* [see next abstract].

LABROUSSE (F.). **Une maladie des Épinards. II. Pythium ultimum Trow, organisme associé à la 'maladie' de l'Épinard et à une pourriture des rhizomes de l'Igname de Chine.** [A disease of Spinach. II. *Pythium ultimum* Trow, an organism

associated with 'the disease' of Spinach and with a rot of the rhizomes of Chinese Yam.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 65–74, 1 fig., 1931.

From the diseased aerial parts of spinach showing the wilt recently reported in France [see preceding abstracts] the author isolated *Pythium ultimum*, also recently reported [*R.A.M.*, x, p. 500] in France on Chinese yam (*Dioscorea batatas*), in the rhizome of which it produced brown lesions which emitted a faint odour of violets.

Cultures of the spinach and yam organisms at first gave a sterile mycelium, with hyphae 1·5 to 5 μ in diameter, which, inoculated into potatoes, rapidly caused an infection accompanied by a reddish discoloration of the tissues. In the potato the mycelium was wholly intracellular, the intercellular nature of the mycelium of *P. ultimum* in spinach being apparently conditioned by the host. No cultural differences were observed between the yam and spinach organisms.

On bean meal agar or in water, after a week to a fortnight, oval, usually subspherical, terminal, occasionally intercalary, thin-walled asexual spores developed, measuring 15 to 25 μ (average 20 μ) in diameter, and showing no papilla. As their mode of germination could not be observed, they are regarded as conidia. Thick-walled, yellowish-brown chlamydospores and piriform, elongated swellings resembling the 'gemmae' of *P. rostratum* were also noted, the latter being occasionally in pairs.

On maize meal agar, sexual organs with paragynous antheridia rapidly formed, sometimes to the exclusion of any other type of fructification; they were characterized by a smooth oogonium 18 to 22 μ in diameter enclosing an oospore 17 to 19 μ in diameter, with a smooth, light brown membrane 1·5 μ thick, and a reniform antheridium, 8 to 11 by 3 to 5 μ, borne on the stalk of, and in close proximity to, the oogonium.

The paper concludes with a brief discussion of the morphological differences between *P. ultimum* and *P. de Baryanum* [cf. ibid., vi, p. 510], and with the suggestion that the yam disease reported from Jamaica some years ago [ibid., iii, p. 376] as associated with a *Pythium* or a *Phytophthora* may have been identical with that described in the present paper.

A short bibliography is appended.

DUFRÉNOY (J.). **Une maladie des Épinards. III. Étude cytologique d'Épinards parasités.** [A disease of Spinach. III. A cytological study of parasitized Spinach.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 74–80, 5 figs., 1931.

In spinach attacked by *Pythium ultimum* [see preceding abstracts] the hyphae pass between the living cells of the parenchyma of the petioles or collar, flatten out into a palm-leaf shape and pass into the cells. The presence of the intercellular hyphae produces a fragmentation of the vacuolar apparatus in the neighbouring cells. The normal spinach cell generally contains a large vacuole, but the approach of the mycelium of *P. ultimum* determines in the adjoining cells the formation of a network of cyto-

plasmic trabeculae delimiting a series of small vacuoles: this fragmentation may affect more than one layer of cells.

BREMER (H.). **Die Blattfleckenkrankheit oder der 'Rost' des Selleries.** [The leaf spot disease or 'rust' of Celery.]—*Obst- und Gemüsebau*, lxxvii, 6, pp. 94–95, 2 figs., 1931.

Good results have been obtained in the control of celery leaf spot (*Septoria apii*) in Germany [*R.A.M.*, ix, p. 357] by immersion of the seed for 15 minutes in copper sulphate (20 gm. in 1 l. of warm water); disinfection of the seed-bed with formaldehyde (0·5 l. in 12 l. of water per 2 sq. m., followed immediately by the same quantity of pure water); and where necessary spraying with 1 per cent. Bordeaux mixture. In the wet summer of 1930 the last-named treatment (two applications) resulted in an 80 per cent. increase of yield. It is estimated that with an outlay for treatment of only M. 0·50 an increased production of 10·60 kg. of roots [celeriac] was obtained.

BAUDYŠ (E.). **Die Blattfleckenkrankheit des Selleries.** [The leaf spot disease of Celery.]—*Nachricht. über Schädlingsbekämpf.*, vi, 2, pp. 54–55, 1 fig., 1931.

Popular notes are given on the occurrence of leaf spot of celery (*Septoria apii*) in Czecho-Slovakia [see preceding abstract] and on its control by the following measures: disinfection of the seed-beds with 0·5 per cent. uspulun (1 l. per sq. m.) 14 days before planting, ten minutes' immersion of the seed in 0·25 per cent. uspulun or mixing for the same length of time with tillantin R dust (8 gm. per kg.), and fortnightly applications of 1 per cent. solbar during the growing period. The Alabaster and Verbesserter Rhein-Markt varieties appear to be somewhat resistant to leaf spot.

WALKER (M. N.) & WEBER (G. F.). **Diseases of Watermelons in Florida.**—*Florida Agric. Exper. Stat. Bull.* 225, 52 pp., 30 figs., 1931.

After a brief indication of the economic importance of the watermelon in the State of Florida, where between 25,000 and 35,000 acres are planted to this crop every year, the author gives summarized accounts, written in popular language, of the chief troubles and diseases which affect it there. The latter include anthracnose (*Colletotrichum lagenarium*), wilt (*Fusarium niveum*), southern wilt (*Sclerotium rolfsii*), gummy-stem blight (*Mycosphaerella citrullina*), stem-end rot (*Diplodia* sp.), blossom-end rot (*Pythium de Baryanum*), downy mildew (*Pseudoperonospora cubensis*), powdery mildew (*Erysiphe cichoracearum*), leaf spots (*Cercospora citrullina* and *Macrosporium cucumerinum* [*Alternaria cucumerina*]), and ground rot (*Corticium vagum*) [*C. solani*]. Control measures are indicated for each disease, and a section deals with the preparation of fungicides and their application, as well as with seed disinfection.

STEVENS (F. L.). **The ascigerous stage of Colletotrichum lagenarium induced by ultra-violet irradiation.**—*Mycologia*, xxiii, 2, pp. 134–139, 3 figs., 1931.

When cultures of two strains of *Colletotrichum lagenarium*, one

from melon in Illinois and the other received from Georgia, were exposed to ultra-violet irradiation [cf. *R.A.M.*, x, p. 483], numerous perithecia developed in the outer regions of opaque areas (referred to by the author as 'plexi') which formed within the irradiated parts. In their early stages the perithecia closely resembled those of *Glomerella cingulata,* being hyaline at first, later dark, and showing reticulations, but they never exceeded 100 μ in diameter and only immature ascospores were seen.

As the ascigerous stage has not previously been described and is clearly congeneric with *G. cingulata,* the author proposes the name *G. lagenarium.* The conidial stage has received the following names: *Fusarium lagenarium* Passerini, 1868; *Gloeosporium lagenarium* (Pass.) Sacc. et Roum., 1880; *Gloeosporium reticulatum* Roumeguère, 1880; *Colletotrichum oligochaetum* Cavara, 1889; and *C. lagenarium* (Pass.) Ellis et Hals., 1893. The last is regarded as the correct name for the conidial stage of *G. lagenarium.*

MERJANIAN (A.) & KOVALEVA (Mme M. V.). **Sur une nouvelle maladie bacillaire des grains de Raisin.** [A new bacillary disease of Grape berries.]—*Prog. Agric. et Vitic.*, xcv, 25, pp. 594–599; xcvi, 27, pp. 17–21, 1 col. pl., 2 figs., 1931.

An account is given of a disease of the grape (chiefly table varieties, e.g., Chaouch and Bicane) which was first noticed in 1927 in the vicinity of Anapa [North-Caucasian littoral of the Black Sea], and was very widespread and destructive in that region in 1928 and 1929. The grape berries are susceptible to infection from the very first days of their formation up to the moment when they soften prior to maturing, but attempts to infect the ovary or other flower organs before the setting of the fruit gave negative results in every case. The first symptom, which may appear at random on any point of the surface of the berry, is the appearance of a small, yellow, subcuticular spot, with a corresponding depression in the skin; the depressed spot rapidly increases in size, the skin assuming a yellowish-brown tinge, later turning purple-brown and drying up. In some cases the lesion remained localized to one-half of the berry, but generally the whole fruit was invaded and killed, finally dropping off the bunch. The disease ran its full course on a fruit in five to seven days. It was noticed that the grapes most exposed to direct sunlight were the first to be attacked, and usually only a proportion of the berries in a bunch were infected, the others continuing to develop normally.

Field observations tended to show that infection occurs through slight scratches in the cuticle of the berries, caused by sand storms which are very prevalent in the Anapa area during spring and summer, and that it is dependent on high air temperatures (28° to 30° C.).

Isolations from diseased tissues of the grapes yielded ten species of bacteria, all of which were tested in inoculation experiments, but only one of which gave positive results. On slightly acid beef peptone agar the organism formed dull white, fairly large and convex colonies, while on agar alone the latter took the form

of a fusiform, wrinkled pellicle with ragged edges. In two-day-old cultures the organism appeared as sporulating, hyaline, non-motile rods, 2·5 to 5 by 0·8 to 1·25 μ, disposed in chains, readily staining with aniline dyes, e.g. fuchsin, and the like, but not with solutions of iodine and carmine. It is aerobic, liquefies gelatine, produces sulphuretted hydrogen and ammonia, does not ferment sugars, and forms a proteolytic ferment. Its optimum temperature for growth was 35° C., with a minimum at 15° to 16°, and a maximum at 43°; the latter temperature, however, did not kill the organism. The spores are very resistant to desiccation, since they were only killed after three weeks' drying in a desiccator. The organism is considered to be new to science and is named provisionally *Bacillus vitis*.

Inoculation experiments on grapes gave practically 100 per cent. positive infection through wounds, but the slight percentage of infection on uninjured berries would indicate that infection through the stomata is not precluded in nature.

Downy mildew of the Vine (Plasmopara viticola).—*Agric. Supplement* 36 to *Cyprus Gaz.* 2144, 5 pp., 2 figs., 26th June, 1931.

Downy mildew of the vine (*Plasmopara viticola*) was first observed in Cyprus in 1916, when a minor outbreak occurred at Stroumbi. In 1920 a more serious epidemic developed at the same place, which was declared infected under the Diseases of Plants Prevention Law, 1893, spraying at the same time being enforced. From 1920 to 1930 the disease did not occur in a severe form, but on 8th June, 1931, notice was given of an outbreak in the Paphos district and vine-growers were advised to use a preventive spray in order to safeguard the forthcoming vintage. Popular notes are given on the symptoms, phenology, and control of the disease.

CADORET (A.). **Le sulfatage des Grappes.** [Spraying the Grape bunches.]—*Prog. Agric. et Vitic.*, xcv, 23, pp. 542–543, 1931.

In this note [which is a reply to criticisms directed against his recent communication: *R.A.M.*, x, p. 154] the author again stresses the importance, for the effective control of vine mildew [*Plasmopara viticola*], of exposing the grapes on vigorous stocks to the full effect of the protective sprays by means of judicious pruning and removal of excessive foliage. This should be done, starting with the second treatment, and continued as long as the grapes remain susceptible to infection. In warm climates preference should be given to the training of the vines fan-wise on wires as opposed to the 'closed goblet' shape of the stocks, in which the grape bunches are too much covered by the foliage. A further improvement suggested in the application of the sprays would be the introduction of a nozzle throwing a cylindrical, penetrating spray, instead of the present Rillez [Riley or cyclone] nozzle which is the most commonly used in France, since the spray from the latter hardly reaches the bunches when they are hidden by luxuriant foliage. The precautions outlined should also be helpful in considerably reducing the number of sprayings in bad mildew seasons.

BÈNES (G.). **Contribution à l'étude sur le court-noué. Quelques conditions qui paraissent rendre le sol apte à engendrer du court-noué.** [Contribution to the study of court-noué. Some conditions which seem to predispose the soil to court-noué.]—*Prog. Agric. et Vitic.*, xcv, 19, pp. 444–446, 1931.

In further development of his theory that court-noué of the vine is mainly due to the lack in the soil of one or more elements necessary for the normal life of the plant [*R.A.M.*, x, p. 642], the author briefly discusses the three chief causes which, in his observation, appear to be responsible for this deficit, namely, leaching of the soil by running water, the gradual reduction of such substances in the soil through absorption by the plant, and their neutralization by waterlogging or defective cultural methods.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1930.** [Review of phytopathological records in 1930.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 1, pp. 1–50, 1931.

In this report, which is on similar lines to those for previous years [cf. *R.A.M.*, x, p. 222], brief notes are given on numerous plant diseases recorded in Italy and some of the Italian colonies in Africa during the period under review.

'Esca' disease of the vine, associated with *Fomes igniarius* var. *viticidus* and *Stereum hirsutum* [ibid., i, p. 416; iii, p. 315; v, p. 592; viii, p. 222], was present at Palermo and near Rome. In view of the similarity to cotton leaf curl in the Sudan [ibid., ix, p. 651] of the condition of vine leaves recently reported by Mencacci [ibid., x, p. 158], in which the leaves bear enations on their under surface, it is now considered possible that the latter may also be due to a virus.

A serious branch canker of pears, affecting not only the branches but also the trunks of young trees, appears to be prevalent throughout southern Italy and Sicily. The pycnidia of a species of *Cytosporella* were occasionally present on the surface of the lesions, but the fungus was not found pathogenic to pear branches and it was probably secondary to injuries due to cold. Young pear branches developed a bacterial wilt resembling frost injury, the pith turning ochraceous-yellow. Plum trees in the vicinity of Lucca showed deep necrosis of the bark and sapwood of the branches and trunk, accompanied by brown exudations; bacteria and gum were present in the diseased parts. Cherries in the province of Rieti were severely attacked by *Cercospora cerasella* [ibid., ix, p. 661] and elsewhere by *Clasterosporium carpophilum* [ibid., ix, p. 790]. In Dalmatia, much injury is caused to pomegranates by *Botrytis cinerea* and *Nectriella versoniana* Sacc. et Penz. Fig leaves from Eritrea [Red Sea] showed crustaceous, black lesions on the upper surface caused by a species of *Trabutia* [cf. ibid., v, p. 80], *Kuehneola fici* occasionally being also present, usually on the lower surface. Brown stromata of a fungus closely resembling *T. chinensis* were noted on the leaves of *Ficus* ? *palmata* from the same region.

Lebanon cedars (*Cedrus libani*) and other ornamental conifers in northern Italy were severely attacked by *Lophodermium pinastri*.

Cassava in Italian Somaliland showed a wrinkling of the leaf

blades, which bore numerous small, bullate protuberances associated sometimes with withering; the condition resembled one due to wind injury, but may, it is thought, perhaps be due to a virus [cf. ibid., x, p. 639].

Coffee leaves from Eritrea were attacked by *Sphaerella* [*Mycosphaerella*] *coffeicola* [ibid., vii, p. 144] and *Colletotrichum coffeanum*; the same host showed a sooty mould of the leaves, due to a species of *Phaeosaccardinula* [ibid., x, p. 559], while coffee roots from the same locality were found to be infected by *Rosellinia necatrix*. Leaves of *Cinchona* showing a mosaic, and French beans (*Phaseolus vulgaris*) attacked by *Bacterium phaseoli*, *Phaeoisariopsis* [*Isariopsis*] *griseola* [ibid., ix, p. 626], and *Uromyces appendiculatus* [ibid., x, p. 358] were also received from Eritrea. Celery near Trieste was seriously affected by *Bacillus apii* (Br.) Migula. *Phytophthora hydrophila* [ibid., ix, p. 809] caused foot rot of pepper in gardens near Campobasso, and cucumbers in the vicinity of Chioggia were attacked by *Pythium aphanidermatum* [ibid., viii, p. 18; ix, p. 561].

In Italian Somaliland the leaves and young branches of cotton were attacked by *Pseudomonas* [*Bact.*] *malvacearum*; the former also showed the presence of *Ramularia areola* [ibid., ix, p. 590]. Aniseed (*Pimpinella anisum*) near Ascoli Piceno was severely infected by *Plasmopara nivea*. Groundnuts (*Arachis hypogaea*) in Cyrenaica [north Africa] were affected by *Pseudomonas* [*Bact.*] *solanacearum*, and in Italian Somaliland by *Cercospora personata* [ibid., ix, p. 226]. Collar rot of asters in Rome was associated with a species of *Fusarium* closely resembling *F. conglutinans* var. *callistephi*. In the diseased aerial parts of wilted dahlias from Bologna the author found *F. udum*.

SIEMASZKO (W.). **Phytopathologische Beobachtungen in Polen. II. Mitteilung.** [Phytopathological observations in Poland. Note II.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxiv, 8–14, pp. 248–251, 1931.

Notes are given on some of the more important or rare plant diseases observed in Poland, principally during the years 1929 and 1930 [cf. *R.A.M.*, viii, p. 630]. The following items, other than those already noticed from different sources, may be mentioned. Bacterial tumours, similar to those produced on *Pinus halepensis* and *P. cembra* by *Bacterium pini* [ibid., iv, pp. 196, 514], were found on the branches of *Picea excelsa* in the forest of Bialowies, generally causing die-back. *Trichosphaeria parasitica* was observed on 10- to 15-year-old *P. excelsa* trees in damp localities in the same forest, this being the first record of its occurrence in the Polish plains. Immature perithecia of *Microsphaera quercina* were detected on severely mildewed beech leaves near Puławy in the autumn of 1929; the trees had been badly damaged by the intense cold of the preceding winter. The infected individuals were close to pedunculate oaks [*Quercus pedunculata*], the young shoots of which were covered with the conidia and perithecia of the fungus [ibid., viii, p. 291]. This is stated to be the first record of the disease on beech in Poland [cf. ibid., vi, pp. 125, 511].

Green shoots of gooseberry bushes in the Warsaw district were attacked in June, 1929 by *Phytophthora omnivora* [ibid., ii, p. 303; ix, p. 136]. Leaf curl and mosaic of raspberries is fairly prevalent in central Poland. Stored apples in Warsaw showed frequent infection by *Sphaeropsis malorum* [*Physalospora cydoniae*] in 1929 and 1930.

Cultivated hops were attacked by *Bacterium tumefaciens* in the Lublin district in 1929 [ibid., viii, p. 400], and by downy mildew (*Pseudoperonospora humuli*) in central Poland in 1930 [ibid., vi, p. 694].

Sclerotium rhizodes frequently occurred in both years in an injurious form on various grasses [ibid., x, p. 191].

In 1930 *Colletotrichum lini* was observed, for the first time in Poland, on flax seed and stems.

Coniothyrium wernsdorffiae [ibid., ix, p. 721] was observed for the first time on wild and cultivated roses in the Puławy district during 1929.

Uredo- and teleutospores of *Uropyxis sanguinea* [*Puccinia mirabilissima*] were found on *Mahonia* [*Berberis*] *aquifolium* in 1930 [ibid., x, p. 316].

Cucumbers and *Cucurbita* sp. often suffered severe damage from *Pythium aphanidermatum* [see preceding abstract] near Warsaw in the autumn of 1930.

EASTHAM (J. W.). **Plant pathology branch.**—*Twenty-fifth Ann. Rept. Dept. of Agric. British Columbia, for the year 1930*, pp. G 46–G 49, 1931.

The following conclusions may be drawn from the work conducted during 1930 in connexion with the project for the correlation of spraying against apple scab [*Venturia inaequalis*] with weather conditions and ascospore discharge [*R.A.M.*, x, p. 11]. Great differences may occur in the number of ascospores discharged in orchards fairly close together. Even with ascospore discharge at a minimum, there is ample opportunity for scab to become epidemic in such a season as 1930, which was ideal for the development of the fungus, by the rapid multiplication of the conidial stage from a few primary infections. Under local conditions in the West Kootenays, the chief value of microscopic observation of ascospore discharge is to notify growers when to apply the first spray. Spraying should be carried out at 14-day intervals. The first ascospores were detected on 25th April and the first conidia on 19th May.

Heavy losses, amounting to over 50 per cent. in some cases, occurred among *Iris tingitana* bulbs, from diseased specimens of which a bacterial organism and a species of *Penicillium* were isolated. *Lilium auratum* and *L. speciosum* bulbs from Japan were severely affected by two kinds of rot. One occurs in the form of localized spots on the outer scales or working back from the scale tips, from which a species of *Penicillium* was consistently obtained. On inoculation into the broken surface of a healthy bulb scale the fungus produced a rather slow rotting. The other type of rot is softer and often involves the whole bulb; it was

found to be due to a species of *Rhizopus* (? *R. necans* or *R. nigricans*), which caused complete rotting within three days when placed on the injured surface of a large sound scale.

Cook (M. T.). **Annual Report of the Division of Botany and Plant Pathology for 1929-30.**—*Ann. Rept. Insular Exper. Stat. Dept. of Agric. & Labor Porto Rico, fiscal year 1929–1930*, pp. 93–109, 1 pl., 1931.

Among the numerous items of interest in this report (some of which have already been noticed from other sources), the following may be mentioned. One of the most important parasitic fungi of Porto Rico is *Thielaviopsis* [*Ceratostomella*] *paradoxa*, which is destructive on sugar-cane roots during the cool months of the year [*R.A.M.*, x, p. 691], and also attacks pineapples and many other plants and causes a nut fall in coco-nuts. Sheath spot (*Cercospora vaginae*) [ibid., ix, p. 808] is prevalent on many varieties of sugar-cane and appears to be of considerable importance. Brown stripe (*Helminthosporium stenospilum*) [ibid., viii, p. 404] is sometimes very abundant on BH–10(12) cane suffering from arrested growth, while red stripe (*Phytomonas rubrilineans*) has become more prominent during the period under review, but seems to be of minor importance.

J. A. B. Nolla reports that damping-off of tobacco seedlings (*Pythium de Baryanum* and *Phytophthora nicotianae*) may be controlled by the application to the soil of 4–4–50 or 5–5–50 Bordeaux mixture ($\frac{1}{2}$ gall. per sq. ft.) before sowing the seed, followed by a second application 10 to 14 days after germination.

Black shank disease of tobacco (*P. nicotianae*) has greatly decreased in prevalence since the discontinuance of the cultivation of wrapper varieties. The variety most severely attacked in the Caguas experimental plots was Esmeralda, imported from the Cauca valley of Colombia (49 per cent. infection and 15 per cent. loss). A serious case was also observed on a three-acre planting of Havana Seed binder from Connecticut (total infection 8 per cent.).

The increased acreage under bananas has resulted in an accentuation of Panama disease (*Fusarium cubense*) [ibid., x, p. 324].

The most important disease of citrus is scab (*Sporotrichum citri*) [ibid., x, p. 594]. Stem-end rot of citrus fruit (*Diplodia natalensis* and *Phomopsis citri*) as a shipping problem appears to be on the verge of solution by pre-cooling, but these fungi require attention in connexion with die-back of the trees. A disease of seedling citrus plants was found to be caused by *Phytophthora palmivora*.

Anthracnose of onions (*Colletotrichum chardonianum* Nolla) [ibid., vii, p. 215] occurred in Cayey and Rio Piedras. The same host was severely attacked in Barros by *Alternaria allii* Nolla [ibid., vi, p. 524].

The chief diseases of [chilli] pepper are leaf spot (*Cercospora capsici*) and mosaic [see below, p. 809].

Late blight of potatoes (*P. infestans*) was very severe in the higher altitudes, while scab (*Actinomyces scabies*) was common even on treated tubers.

MOTTE (J.). **La tumeur à 'Bacterium tumefaciens' et le cancer.** [The tumour due to *Bacterium tumefaciens* and cancer.]—*Thèse Fac. Med. Montpellier,* 100 pp., 1930. [Abs. in *Bull. Inst. Pasteur,* xxix, 15, pp. 726–727, 1931.]

In the opening section of this work the author, after an historical survey, discusses the bacteriology, experimental reproduction, structure, and development of the tumours caused by *Bacterium tumefaciens,* reviews the theories proposed to explain the action of the bacterium (chemical action, filterable forms, radiations), and describes the results of radiotherapy as applied to the growths. The second part is devoted to the consideration of a possible parallel between crown gall and cancer. As long as the cause of the latter is unknown, the writer thinks that any conclusion as to homology of the two processes must necessarily be premature.

A bibliography of nine pages is appended.

MARESQUELLE (H. J.). **Action de Bacterium tumefaciens Smith et Townsend sur la régénération, dans la racine de Taraxacum dens leonis Desf.** [Effect of *Bacterium tumefaciens* Smith & Townsend on the process of regeneration in roots of *Taraxacum dens leonis* Desf.]—*Comptes rendus Acad. des Sciences,* cxciii, 3, pp. 190–192, 1931.

The author states that when long portions of dandelion (*Taraxacum dens leonis*) [*T. officinale*] roots are removed and inoculated with *Bacterium tumefaciens* at the two cut ends, the normal regenerative process at the proximal end is arrested, inasmuch as instead of differentiating into new shoots the tissues simply proliferate to form gall-like tumours. A similar process also sets in at the distal cut end which in normal (uninoculated) sections usually heals by the formation of an undifferentiated callus. The tumour outgrowths at both ends tend to form an epidermis below the first-formed layer of cork which is broken through after some time under the pressure of the proliferating underlying tissue covered by this epidermis. A well-developed outgrowth thus may be covered with an epidermis over the greater part of its surface, and remain suberized only at its base. The cuticularized portion usually bears numerous trichomes, and not infrequently very irregularly deformed leaf primordia. The inoculation of dandelion roots with *Bact. tumefaciens* results, therefore, in the suppression of the polarity of the normal regenerative process, since tissue proliferation occurs at both ends of the sections instead of remaining confined to the top extremity, and in the arrest of the normal differentiation of the new tissues, which often remain as a mass of parenchyma covered by an epidermis instead of producing new shoots.

STAPP (C.) & BORTELS (H.). **Der Pflanzenkrebs und sein Erreger, Pseudomonas tumefaciens. I. Mitteilung: Konstitution und Tumorbildung der Wirtspflanze.** [Plant cancer and its causal organism, *Pseudomonas tumefaciens.* Note I: constitution and tumour formation of the host plant.]—*Zeitschr. für Parasitenkunde,* iii, 4, pp. 654–663, 7 figs., 1931.

Inoculation experiments [which are fully described] with *Pseudo-*

monas [*Bacterium*] *tumefaciens* (Stapp's *Chrysanthemum frutescens* II b strain) on flowering and non-flowering tomato, *Datura stramonium*, and *Pelargonium zonale* plants showed that tumour formation is impeded and the shape of the excrescences considerably modified by the processes of flowering and fruiting in the host plant.

LEVINE (M.). **Studies in the cytology of cancer.**—*Amer. Journ. of Cancer*, xv, 3, pp. 1410–1494, 63 figs., 1931.

This includes a comprehensive and copiously illustrated account of the writer's work on the chromosome numbers of crown galls of beet and tobacco (*Bacterium tumefaciens*), a condensed account of which has already been noticed from another source [*R.A.M.*, x, p. 646].

CRÉPIN (C.). **Note sur la rouille noire.** [Note on black rust.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 22, pp. 734–739, 1931.

In this note (preceded by an introductory statement by Brétignière) the writer gives some data on the losses caused by black rust of wheat (*Puccinia graminis*) in the Saône Valley, France, during 1930, when the disease, favoured by the excessively rainy season, appeared on 20th May and spread rapidly. The yield was reduced from the normal 20 quintals per hect. to 10 quintals of grain which was practically useless for milling. The financial loss incurred as a result of this infection by *P. graminis* is estimated at Fr. 1,750 per hect. The damage was particularly severe in fields receiving heavy applications of nitrogen. A fair degree of resistance was shown by the early varieties, Mouton à épi rouge, K 3, Préparateur Étienne, Piave 692, P.L.M.I., and Institut Agronomique, as well as by the late variety Ina; Ardito (early) and Wilhelmina (late) proved very susceptible.

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DILLON WESTON (W. A. R.). **Effect of light on urediniospores of black stem rust of Wheat, Puccinia graminis tritici.**—*Nature*, cxxviii, 3219, pp. 67–68, 1931.

Working at the Dominion Rust Research Laboratory, Winnipeg, Canada, the writer found that the pigment in the epispore of a normal uredospore of wheat rust (*Puccinia graminis tritici*) protected it from injury by the ultra-violet light emanating from a mercury vapour sun lamp in the laboratory.

In out-of-door experiments on bright days during April and May [1931], no germination occurred when the uredospores were dusted lightly on the surface of distilled water and exposed either to direct sunlight or to very strong diffused light, whereas those kept under similar conditions in the dark germinated readily [cf. *R.A.M.*, x, p. 587]. The same phenomenon was observed when the dishes containing the spores were covered by ordinary glass, or by glass transmitting the ultra-violet rays. In controlled tests

in the dark room, using ten 100-watt lamps, the incidence of germination increased in proportion to the distance of the spores from the source of light.

When the uredospores were covered with Wratten Standard light filters and exposed to sunlight, germination was abundant under the green and blue filters, but only scanty under the red, scarlet, orange, yellow, or purple filters except when the light intensities were low. When the spectrum was used, no germination took place among spores exposed to the rays from the red end. Uredospores dusted lightly on Congo red dye failed to germinate in the sunlight, whereas on light green germination was normal.

Different physiological forms of the rust on wheat and oats were found to behave in the same manner in these experiments.

FOSTER (W. R.). **Cereal smuts.**—*Brit. Columbia Dept. of Agric. Field Crop Circ.* 10, 12 pp., 6 figs., 1 diag., 1931.

Popular notes are given on the occurrence of the following cereal diseases in British Columbia: bunt of wheat (*Tilletia tritici* and *T. levis*) [*T. caries* and *foetens*], loose smut of wheat (*Ustilago tritici*), loose and covered smuts of barley (*U. nuda* and *U. hordei*), and loose and covered smuts of oats (*U. avenae* and *U. levis* [*U. kolleri*]). Recommendations are made for the control of these diseases by copper carbonate dust for wheat bunt when the seed-grain is not too badly contaminated, formalin for wheat bunt, covered smut of barley, and both smuts of oats, and hot water for both covered and loose smuts.

MITRA (M.). **A new bunt on Wheat in India.**—*Ann. of Appl. Biol.*, xviii, 2, pp. 178–179, 1 pl., 1 fig., 1931.

A brief description is given of a species of *Tilletia* different from *T. caries* and *T. foetens*, which was isolated by the author from specimens of hybrid wheats from Karnal, Punjab. The smut affected only partially the grains, which were not swollen. It did not wholly destroy the embryo tissue, to which it was frequently restricted; in some cases the infection spread to the tissues along the groove, but the endosperm along the smooth side of the grain was uninfected. The sori in the ovaries were in the form of dusty spore masses, oblong or ovoid, 1 to 3 mm. long, brown to dark brown, partially destroying the kernel. When mature the spores were brown to dark brown, spherical or subspherical or oval, 22 to 42 by 25 to 40 μ in diameter (average 35·5 μ, exceptionally up to 55 μ long). The proliferations of the epispore are reticulate, the ridges somewhat roundish or irregular, showing at the circumference of the spore a band about 2 to 4 μ wide. The spores often have a papilla or thread of detachment at one side. Intermingled with them are numerous large, yellowish or subhyaline sterile cells.

The fungus, for which the name *T. indica* n.sp. is suggested, differs from *T. caries* in that it has no greasy spore mass and no smell of decaying fish, and in that the much larger spores dry into little masses which are capable of being blown about by wind.

NIEVES (R.). **Resistencia comparativa a la Tilletia levis Kühn, del Trigo, en la Argentina.** [Comparative resistance of Wheat to *Tilletia levis* Kühn in the Argentine.]—*Phytopath.*, xxi, 7, pp. 705–727, 1931. [English summary.]

The results of the author's comparative studies on the reaction of Argentine wheat varieties to bunt (*Tilletia levis*) [*T. foetens*] have already been noticed from another source [*R.A.M.*, x, p. 89].

TWENTYMAN (R. L.). **Experiments on the control of 'stinking' smut or bunt. Part 2. Tests of the dry copper powders.**—*Journ. Dept. Agric. Victoria*, xxix, 5, pp. 235–248, 6 figs., 1 graph, 1931.

This is a detailed account of the results obtained by the Department of Agriculture of Victoria, Australia, in experiments conducted from 1926 to 1930 under field conditions for the purpose of determining the dosage of cupric dusts for the disinfection of wheat seed grain against bunt [*Tilletia caries* and *T. foetens*], and also the relative fungicidal value of the dusts. Besides anhydrous copper sulphate the tests included 14 commercial copper carbonate dusts [which are listed] with a copper content varying from 18 to 54 per cent. and an apparent density from 21 to 67 lb. per cu. ft. It was shown that no minimum quantity of any of the dusts tested can be specified, as the dose required for satisfactory control of wheat bunt depends largely on the spore-load of the seed-grain, and also on the actual conditions under which the seed is sown and on the properties of the local soil. With obviously smutted seed the dose should not be less than 2 oz. of dust per bushel, but with seed comparatively free from bunt $1\frac{1}{2}$ oz. should give satisfactory control under Victoria conditions.

The commercial powders showed much variation in their chemical and physical properties, and also in their ability to control bunt. The best results were given by 'Standard copper carbonate' (a high-grade basic copper carbonate weighing 30 lb. to the cu. ft. and conforming to the standard suggested by the University of California in 1923) [*R.A.M.*, iii, p. 152], kilspor, antibunt, cuprex, aero, and smutol, while the remaining were much less effective. None, however, gave as complete control as anhydrous copper sulphate, though the noxious properties of the dust emitted by the latter during disinfection render its use undesirable.

Experiments in which the dusts were separated into six different grades of fineness of particle size by means of an air flotation apparatus showed that the finer grades were much more effective than the coarser ones. They also demonstrated that the '200 mesh sieve' test as applied to these powders gives a very inadequate measure of the size of the particles, and that a much more useful measure of their approximate fineness may be obtained from the apparent density of the powders, the coarser material having a higher density than the finer. The addition of diluents to the dry copper compounds was found to reduce the fungicidal value of the mixture almost in direct proportion to the quantity admixed.

Limbourn (E. J.). **Flag smut of Wheat. Variety resistance tests, 1926 to 1930.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 2, pp. 214–217, 1931.

The author states that as a result of tests of resistance to flag smut [*Urocystis tritici*: *R.A.M.*, ix, p. 770; x, p. 371] carried out from 1926 to 1930 at the Merredin Experiment Station, Western Australia, 52 out of 128 varieties of wheat were classed as resistant (infection ranging from 0 to 10 per cent.); of this number seven varieties showed no infection, and seven gave only 1 per cent. infection. Ten of these resistant varieties are cross-bred types produced by the local Department of Agriculture, from which six, namely, Bencubbin, Nabawa, Carrabin, S.H.J., Geeralying, and Sutton, may be obtained as pure pedigree seed. It is further stated that the small number of reports of serious losses caused by flag smut from Western Australia of recent years is probably due to the widespread use in that State of the Nabawa variety, which in the tests exhibited not over 1 per cent. infection.

In 1930 the seed-grain tested was infected by mixing 100 grains with two teaspoonfuls of finely minced wheat leaves naturally infected with flag smut, and vigorously shaking the whole; a pinch of the minced infective material was also put over the seed-grain in the experimental plots, before covering it with earth.

Morwood (R. B.). **Flag smut in Wheat experiments, 1930.**—*Queensland Agric. Journ.*, xxxv, 6, pp. 363–367, 1931.

Further tests in the control of flag smut of wheat (*Urocystis tritici*) [see preceding abstract] by seed treatment showed that effective control without any deleterious effect on germination resulted from steeping the seed-grain for 3 minutes in a 1·5 per cent. solution of copper sulphate. Subsequent immersion in a 1 per cent. suspension of slaked lime in water for 3 minutes before allowing the copper sulphate to dry impaired the fungicidal value of the latter. Hot water treatment seriously interfered with germination. Convincing evidence was again obtained that copper carbonate dusting does not satisfactorily control flag smut when the seed is heavily infected.

Feistritzer (W.). **Merkmale zum Erkennen flugbrandkranker Pflanzen bei Winter- und Sommergerste vor dem Ährenschieben.** [Features enabling winter and summer Barley plants infected by loose smut to be recognized before the emergence of the spikes.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 1, pp. 16–17, 1 fig., 1931.

Winter and summer barley plants infected by loose smut [*Ustilago nuda*] may be recognized before the emergence of the spikes by discoloration of the leaf blades, which are yellowish-green to yellow in the winter varieties and ochre to brownish in the summer ones. When held up to the light, the uppermost leaf blade is yellowish-green or yellowish-brown, while the sheath of the same leaf is pale green and transparent in its upper free part and almost black in its basal part owing to the presence of the greenish-black spore masses in the still enclosed ear. The awns which normally fill the upper part of the leaf sheath are stunted or completely

destroyed in diseased ears, and their failure to protrude just before the emergence of the spikes is a further indication of infection by loose smut.

Říha (J.). **Versuchsergebnisse mit trockenen und nassen Saatgutbeizen.** [Experimental results with dry and liquid seed-grain disinfectants.]—*Mitt. Tschechoslowak. Akad. Landw.*, vi, pp. 1078–1079, 1930. [Abs. in *Biedermanns Zentralbl.*, Ab. A, lx, 4, p. 230, 1931.]

The results of tests with a number of dry and liquid seed-grain disinfectants at the Valečov Agricultural Experiment Station, Czecho-Slovakia, indicated that dusts are equally effective with the liquid preparations against the snow fungus of rye [*Calonectria graminicola*] and stripe disease of barley [*Helminthosporium gramineum*]. They are also reasonably efficacious, though not so good as the best liquid treatments, against loose smut of oats [*Ustilago avenae*]. For barley and oats it is necessary to use at least 400 gm. of dust per 100 kg. of seed-grain, whereas for rye 300 gm. are sufficient. The best control of *C. graminicola* was given by abavit B ; both *H. gramineum* and *U. avenae* yielded to treatment with abavit B and tutan, while good results were also obtained in the former case with tillantin-trockenbeize and No. 225 and in the latter with hafertillantin [cf. *R.A.M.*, x, p. 511]. Of the liquid disinfectants germisan was most effective against *H. gramineum*, while *U. avenae* was well controlled by germisan, uspulun-universal, and formalin. The germinability of oat seed-grain was impaired by the higher concentrations of kalimat C and germisan used with the G.K.B. [germisan short disinfection] process.

Bennett (F. T.). **Gibberella saubinetii (Mont.) Sacc. on British cereals. II. Physiological and pathological studies.**—*Ann. of Appl. Biol.*, xviii, 2, pp. 158–177, 3 pl., 2 graphs, 1931.

The author states that since his record of the occurrence of *Gibberella saubinetii* in wheat and barley grain grown in England [*R.A.M.*, ix, p. 516] he has isolated it from the bases of wheat, barley, oats, rye, and *Triticum monococcum* plants collected practically throughout the country, and has also seen an unpublished record of it in 1918 on wheat from Galway, Ireland. Biological and pathological studies [details of which are given] showed that in order to produce perithecia the fungus requires a fairly prolonged period of ample moisture and a mean temperature of not less than 21° to 22° C., a fact which explains the absence of records of these fructifications from England, where such conditions rarely if ever occur under normal summer conditions. The minimum temperature for the germination of the conidia and ascospores of *G. saubinetii* is about 5°. Between 5° and 10° both kinds of spores develop mycelia, and the fungus can infect cereal seedlings which, more especially wheat, make some amount of growth both below and above soil level at these temperatures. The optimum temperature for vegetative growth of the fungus and the production of mature perithecia is about 24°, and the maximum temperature 37°. The fungus is extremely resistant to low temperatures (down to

–20°) in both its vegetative and perithecial phases, and was shown to persist in its vegetative stage throughout the English winter. In this stage it is able to retain its viability for at least two years under storage conditions, and for at least a year (probably much longer) in its perithecial stage. Further tests showed that although heating to 100° C. for five minutes under dry conditions kills *G. saubinetii* on or in infected cereal grains, this treatment is not practicable as it killed practically all of the seed.

Pot experiments indicated that *G. saubinetii* causes seedling blight and foot rot of cereals, but that in this respect it is much less virulent than the two species of *Fusarium* (*F. culmorum* and *F. avenaceum*) [ibid., vii, p. 710] with which it is frequently associated in the north of England. All the three fungi attack the cereal ears in a similar way, with similar virulence and with similar results.

CUMMINS (G. B.). **Heterothallism in Corn rust and effect of filtering the pycnial exudate.**—*Phytopath.*, xxi, 7, pp. 751–753, 1931.

Using the methods developed by Craigie [*R.A.M.*, viii, p. 296], the writer found that maize rust (*Puccinia sorghi*) [*P. maydis*: ibid., x, p. 305], the alternate host of which is *Xanthoxalis* [*Oxalis*] *stricta*, is apparently heterothallic. The same conclusion is stated to have been reached by Mains in unpublished studies.

At Lafayette, Indiana, *O. stricta* plants were exposed to infection by suspended hibernated teleutospore material and transferred to cloth-covered cages to reduce the risk of insect contamination after the pycnidial pustules appeared. Sterile needles were used to transfer exudate from one pustule to another. Of the 52 pustules thus treated, 39 (75 per cent.) formed aecidia, while of the 42 left untouched only 6 (14·3 per cent.) produced these organs. The mixture of pycnidial exudates thus definitely stimulated aecidial formation.

The pycnidial exudate, mixed with a little water, was filtered to remove the pycnospores without interfering with any enzymes likely to stimulate aecidial formation. It was then applied with sterilized needles to 28 isolated pustules (presumably of monosporidial origin) on a group of lightly infected *O. stricta* plants, while 10 other pustules were treated with the non-filtered exudate. Aecidia were formed by all the pustules of the latter group within ten days, whereas none of those treated with the filtered exudate produced these organs until one to three weeks after the usual time, when a few scattered aecidia developed from eight of the pustules [cf. ibid., x, p. 168].

These results are considered to demonstrate the heterothallic nature of *P. maydis* and to substantiate Craigie's conclusion that the presence of living pycnospores, and not merely of a stimulatory enzyme in the pycnidial exudate, is essential to aecidial production.

GARBER (R. J.). **Inbreeding with particular reference to Maize.**—*Journ. Amer. Soc. Agron.*, xxiii, 7, pp. 534–548, 1931.

During the past ten years an inbreeding experiment has been

carried on at the West Virginia Agricultural Experiment Station with the object of isolating relatively homozygous lines of maize resistant to smut [*Ustilago zeae*: *R.A.M.*, x, p. 375]. An epidemic is induced by scattering smutted horse manure between every two maize rows at ten-day intervals, three applications being made in all.

The inbred strains have been found to show, not only considerable differences in their degree of susceptibility to smut, but also with respect to the place of infection. Thus, strains 5–2–2 (Reid's Yellow Dent) and 4–17–4 (Boone County White) have shown a high degree of resistance (1·3 per cent. infection) during each of the nine years of the trials. Relatively high susceptibility, on the other hand, is exhibited by 6–10–1 (Leaming), which was used as a check (61·6 per cent.). The corresponding figures for 8–15–1 (Cocke's Prolific), 5–1–1 (Reid's Yellow Dent), 1–6–1 (Picken's White), and 3–10–2 (Eldridge) were 29·1, 10·9, 18·3, and 16·6 per cent., respectively.

Strain 8–15–1 was predominantly infected in the tassel in each year of the tests except the abnormally dry season of 1930. A similar relationship was observed in the case of 6–10–1. Strain 1–6–1 showed considerable infection below the ear, especially in 1929 and 1930. Smut boils developed in larger numbers immediately below the tassel in plants of strain 5–1–1 and on the ear in those of 3–10–2. These differences are tentatively attributed to the action of genetic factors in the host plants.

Kiesselbach (T. A.) & Culbertson (J. O.). **An analysis of the effects of Diplodia infection and treatment of seed Corn.**—*Journ. Agric. Res.*, xlii, 11, pp. 723–749, 1931.

The statistical study [by a method which is fully explained] in 1929, at the Nebraska Agricultural Experiment Station, of the effect on density of stand, development at all stages of growth, and productivity of maize plants in the field caused by infection of the seed-grain with *Diplodia zeae* and by the treatment of infected and nearly disease-free grain with fungicides [of which semesan jr. alone was used in the 1929 tests] entirely confirmed the results obtained in preceding years in this investigation [*R.A.M.*, ix, p. 521]. It again showed that seed disinfection is beneficial only in those cases where growers are obliged to use seed so highly infected with *D. zeae* as decidedly to reduce the stand, since during five years' experiments treated farm-selected (clean) maize seed-grain was unaffected in stand and yielded on the average one-half bushel less per acre than the untreated. The study also indicated that the disease curtails the development of some of the surviving plants to such an extent as to reduce the mean plant height by two or three inches, and increases somewhat the variability of the growing population, but at maturity the relative differences are to a great extent levelled out. The whole investigation tends to show that in Nebraska the slight loss of viability due to this organism is negligible in the case of the usual farm-selected grain.

BERTUS (L. S.). **Spraying against canker of Citrus.**—*Trop. Agriculturist*, lxxvi, 6, pp. 337–339, 1931.

After stating that canker (*Pseudomonas citri*) [*R.A.M.*, x, p. 592] is one of the commonest diseases of citrus trees in Ceylon, the author gives brief details of spraying experiments in 1930–1 at the Peradeniya Experiment Station on three-year-old grapefruit trees, the results of which showed that the disease may be successfully controlled by weekly applications of a 1 per cent. solution of concentrated lime-sulphur or by fortnightly applications of a 2 per cent. solution, supplemented by the removal and destruction by fire of all affected twigs and leaves. Since the young leaves are the most susceptible, the trees should be encouraged by judicious watering and other cultural methods to produce new foliage during the drier periods of the season, in which canker infection is not so common. The sprays were also effective in practically wiping out some of the scale insects and the green bug (*Coccus viridis*) which infested the trees, and the sooty moulds developing on their secretions. The routine treatment recommended should be helpful also in preventing infection by pink disease (*Corticium salmonicolor*) [ibid., ix, p. 632] and mildew (*Oidium tingitaninum*) [ibid., ix, p. 627].

JENKINS (ANNA E.). **Development of the Citrus-scab organism, Sphaceloma fawcettii.**—*Journ. Agric. Res.*, xlii, 9, pp. 545–558, 1 col. pl., 5 figs., 1931.

In this paper the author describes in detail her observations in Florida in 1928, on the superficial development of citrus scab (*Sphaceloma fawcettii*) [*R.A.M.*, iv, p. 476; v, p. 310] on the leaves of sour orange (*Citrus aurantium*), grapefruit (*C. grandis*), and Tahiti lime (*C. aurantifolia*), and on young fruits of the grapefruit. Details are also given of her studies of the organism in pure culture and in inoculation experiments, the main purpose of the whole investigation being to present data allowing of differentiating it from other organisms with which it has been confused. *S. fawcettii* appears to have been present in Florida as early as 1878, and it was probably recorded in Paraguay in 1882; citrus material collected in Buitenzorg in 1919, which was examined by the author, proves the occurrence of a citrus-inhabiting species of *Sphaceloma* in Java, but its identity with *S. fawcettii* still remains to be demonstrated.

Observations of the development of scab on citrus leaves showed that the fructifications of the fungus may be from the first practically absent from the surface of young lesions of the gall type, particularly those considerably raised, or may occur in small solitary clumps or larger masses on the marginal rims, sometimes outlining trough-like depressions or grooves. Where a cork layer extends as a continuous band from one side of the leaf to the other [ibid., vii, p. 715], the fungus sometimes fruits on both surfaces of the lesion, and where the necrotic centre of such a lesion has fallen away, it may fruit scantily on the faces of the hypertrophied tissue thus exposed. On lesions in which the tissue has become completely necrotic conidial fructifications often cover practically the entire area of the surface originally infected,

and may also be numerous on the opposite side. Records made during the spring of 1925 showed that the conidial fructifications may be present on the same lesions for as long as four months. Considerable details are given of the variations observed in the coloration of the masses of conidia and conidiophores on the surface of the lesions on the leaves, stems, and fruits at different stages of development.

A description is given of the spherical microconidia referred to in a previous communication [ibid., x, p. 577] as having been discovered in *S. fawcettii*, besides the ovoid-elliptical hyaline and coloured conidia previously described: they ranged from 1 to 4 μ in diameter, and the hyaline ones were often glistening and highly refringent, especially when thick-walled. The various forms of conidia observed are considered to be homologous or merely to represent older or younger forms. In pure culture the fungus formed colonies of two markedly different forms, namely a convoluted and a pulvinate type.

Inoculation experiments demonstrated the pathogenicity of *S. fawcettii* to rough lemon (*C. limonia*) and Cuban shaddock (*Citrus* sp. hybrid No. 11893), besides the hosts mentioned above, but citrangequat (*Fortunella marginata* × Willits citrange No. 48010) was apparently immune. The fungus retained its pathogenicity on citrus after having been grown in culture for a period of 11 years.

VENKATARAYAN (S. V.). **The trunk-splitting disease of Areca Palms.**—*Mysore Agric. Calendar, 1931*, pp. 49–50, 1 pl., 1931.

Of recent years a hitherto undescribed disease has developed on areca [*Areca catechu*] palms in the rainy districts of Mysore and the adjacent regions of north and south Kanara in India. The first symptom is a longitudinal crack, exposing blackened tissue, on one face of the trunk, usually that towards the west or southwest. The wound begins about 3 or 4 ft. below the lowest bunch and may extend downwards for 20 or 25 ft.; in severe cases almost the entire trunk may be involved. The infected underlying tissues extend to a depth of one-half to one inch. The disease affects palms of practically every age above eight to ten years; it is more virulent in the exposed portions of the garden near the outskirts than in the interior. A normal crop may be borne by diseased palms for a number of years, but ultimately the trunk becomes so weakened that the top readily breaks away in such operations as spraying and harvesting.

The etiology of the disease is still obscure. Fruit bodies of a bracket fungus, differing from those of 'anabe roga' due to *Ganoderma lucidum* [*R.A.M.*, viii, p. 564], have been obtained from parts of the trunk near the longitudinal grooves in standing trees, and the presence of a fungus in the diseased tissues has been revealed by microscopic examination. Cultures of this organism are now being made and will be inoculated into healthy trees. Possibly the fungus is a wound parasite which enters the tissues through cracks due to sunburn.

BALLY (W.). **Bestrijding van djamoer oepas in de Koffie.** [Control of pink disease in Coffee.]—*De Bergcultures*, v, 28, pp. 754–755, 1931.

Very good control of pink disease of coffee (*Corticium*) [*salmonicolor*] has been obtained on an estate in the Malang district of Java by the application of Bordeaux mixture to infected branches, all of which recovered when treated in time, i.e., before the formation of *Corticium* and *Necator* fructifications [*R.A.M.*, viii, p. 777]. The cost of the treatment in a severely infected garden was Fl. 5·95 per bouw [1 bouw=0·71 hect.] inclusive of wages and supervision, while in milder cases it ranged from Fl. 0·60 to 1·50. It is important that the fungicide be applied when the fungus is still in the cobweb or cushion stage. Pink disease appears to be by no means confined to damp, overshaded gardens, having recently been found repeatedly in the absence of shade.

FORSTENEICHNER (F.). **Die Jugendkrankheiten der Baumwolle in der Türkei.** [The seedling diseases of Cotton in Turkey.]—*Phytopath. Zeitschr.*, iii, 4, pp. 367–412, 7 pl., 3 graphs, 1931.

Full details are given of the writer's investigations on the seedling diseases of cotton in the Adana region of Turkey. The following organisms were found to be involved in the causation of the sore shin disease, viz., *Rhizoctonia gossypii* n. sp., var. *anatolica* n. var., *Rhizopus nigricans*, *Gibberella moniliformis*, *Fusarium scirpi*, and *Alternaria humicola* var. *gossypii* n. var. [*R.A.M.*, x, p. 103].

R. gossypii var. *anatolica* was found to differ in several respects from *R. solani* (*Corticium vagum*) [*C. solani*] isolated from potato in Germany and also from cotton affected with sore shin in Alabama, United States, and from *R. gossypii* var. *aegyptiaca* n. var., as the author renames the causal organism of sore shin in Egypt [ibid., vii, p. 511; ix, p. 290]. The first-named fungus produces characteristic longitudinal sunken areas on the hypocotyl of emergent seedlings about 1 cm. below soil level. The diseased tissue is reddish-brown, firm, and quite dry. The Anatolian variety of *R. gossypii* first kills the outer cell layers and then penetrates the cells, whereas the Egyptian strain begins by invading the normal tissues and subsequently causes the death of the cells. A further point of difference between the two varieties of *R. gossypii* is that the var. *anatolica* makes profuse growth in a glucose-potassium nitrite nutrient medium and is very well able to utilize cellulose in conjunction with potassium nitrate, whereas the var. *aegyptiaca* failed to develop in these media. The Anatolian variety of *R. gossypii* completely failed to fuse with *C. solani* from the United States, but perfect fusion was effected between the Egyptian and American forms.

The tissues of seedlings attacked by *Rhizopus nigricans* turn light brown, become watery, and rapidly undergo complete disorganization. This fungus occurs as a primary parasite usually only on rootlets just emerging from the testa. Wounded tubers of sweet potato and stems of sunflower (*Helianthus annuus*) were also attacked by it.

G. moniliformis produces a brown discoloration of the hypocotyl

above the fissures in the cortical layer of the rootlets caused by *A. humicola* var. *gossypii*. Healthy roots on the point of emergence from the testa are attacked, while the hyphae can also penetrate the epidermis of the hypocotyl of healthy older plants. *G. moniliformis*, however, is of little importance in the Adana region except as a secondary parasite.

F. scirpi is a primary parasite only on rootlets emerging from the testa, and is usually of minor importance.

A. humicola var. *gossypii* attacks both the radicles and the hypocotyl of cotton seedlings, producing longitudinal fissures in the cortical layer from the root collar upwards. The fungus is a true parasite, capable of causing severe damage to the roots of emerging seedlings. The conidia are in chains of 3 to 7, very variable, roundish to oval or obclavate, 11 to 55 by 11 to 15 μ in diameter, and with 1 to 8 transverse and often also some longitudinal septa, the spore being constricted at the transverse septa. The walls are finely spiny.

Infection by the fungi discussed in this paper was found to be greatly favoured by the low mean temperature (16·9° C.) prevailing in the Adana district during the spring, the Lightning Express 2 (*Gossypium hirsutum*) being more susceptible in this respect than Jerli (*G. herbaceum*). Other factors promoting invasion by the organisms in question are the formation of a soil crust and a high degree of soil humidity.

KING (C. J.), LOOMIS (H. F.), & HOPE (C.). **Studies on sclerotia and mycelial strands of the Cotton root-rot fungus.**—*Journ. Agric. Res.*, xlii, 12, pp. 827–840, 3 figs., 1 graph, 1931.

This is a detailed account of the authors' laboratory and field experiments at Sacaton, Arizona, to determine the relationship of the sclerotia and mycelial strands of *Phymatotrichum omnivorum* [*R.A.M.*, x, pp. 186, 454, *et passim*] to the dissemination and perpetuation in the soil of the cotton root rot caused by this fungus. It was found that the mycelium from a germinating sclerotium in the laboratory was capable of extending for 14 cm. through unsterilized soil free from roots. Healthy plants were killed by a pure culture of *P. omnivorum* on dead cotton roots that had been kept in a jar for eleven months and in which no sclerotia were observed.

The sclerotia are very sensitive to desiccation and to heat, since air drying for $1\frac{1}{4}$ hours or immersion for 15 minutes in hot water at 46° C. was sufficient to kill them. Sclerotia immersed in distilled water gave 81 per cent. germination after 92 days, but at the end of 121 days only about 20 per cent. germinated and many showed signs of disintegration. When buried in sand, a maximum temperature of about 43° maintained for two to four minutes was required to kill the sclerotia, while the mycelium in infected cotton roots one-half inch in diameter was only killed at about 51°. The sclerotia were killed by a 1 per cent. formalin solution or 1 in 2,000 mercuric chloride solution in about 30 minutes, and by a 1 in 1,000 mercuric chloride solution in 4 to 5 minutes. Sclerotia buried in soil one to six days after the latter had been treated with a 1 or $1\frac{1}{2}$ per cent. formalin solution were killed in 3 hours, while

the mycelium on infected cotton roots was killed only after 12 hours during the first four days from the formalin treatment and remained alive on roots buried on the sixth day. Exposure for 21 hours to the vapours liberated from a $1\frac{1}{2}$ per cent. slightly heated formalin solution killed the sclerotia, exposed strands, and the active mycelium on cotton roots.

New sclerotia may be developed periodically by a budding process on the surface of old sclerotial clusters or directly from old strands, five or six months after the formation of the first sclerotia. Mycelial strands of *P. omnivorum* grew in 149 days to a distance of 3·2 m. through a long glass tube filled with moist sand, in which small deposits of dead root tissues were placed at intervals of $2\frac{1}{2}$ feet. There was no evidence of a staling effect in the sand, since the fungus was shown to be able to grow three times in succession through the same tube. Some staling, however, was observed in old cultures on nutrient media. In a tube filled with sterilized glass beads and distilled water the mycelial strands advanced to a distance of 511 mm. from the inoculum in 31 days, and developed large numbers of sclerotia over a distance of 250 mm.

Evidence is adduced showing that some types of the mycelial strands of *P. omnivorum* are sclerotial in nature, and may remain viable for long periods under favourable conditions.

STONE (K.) & GARROD (L. P.). **The classification of Monilias by serological methods.**—*Journ. Path. & Bact.*, xxxiv, 4, pp. 429–436, 1931.

All the strains of *Monilia* [*Candida*] isolated by the authors from cases of thrush were found to be identical when examined by means of the complement fixation and precipitin reactions. Of 14 strains of the fungus found in various types of pathological material and tested by these methods [the technique of which is described and the results discussed and tabulated], 12 were found to be identical with the thrush organism (*M.* [*C.*] *albicans*) [*R.A.M.*, x, p. 520]. Six out of ten types of *Monilia* as recognized by Castellani [ibid., viii, p. 103] viz., *M. tropicalis*, *M.* [*C.*] *pinoyi*, *M.* [*C.*] *candida*, *M.* [*C.*] *psilosis*, *M.* [*C.*] *albicans*, and *M. metalondinensis*, were also shown by these tests to be identical with the thrush fungus.

HALER (D. H.). **Notes on the incidence of yeast-like organisms in chronic paronychia.**—*Brit. Journ. of Dermatology*, xliii, 7, pp. 343–351, 1931.

Monilia [*Candida*] *pinoyi* [*R.A.M.*, x, p. 312] was isolated from 24 out of 25 cases of chronic paronychia (20 among women) investigated by the author. The disease is usually bilateral, and affects the majority of the posterior nail-folds. No organism of the above type was isolated from normal hands.

BENNETT (S. C. J.). **Cryptococcus pneumonia in Equidae.**—*Journ. Compar. Path. & Therapeutics*, xliv, 2, pp. 85–105, 7 figs., 1931.

Full clinical details are given of a hitherto undescribed type of *Cryptococcus* infection in horses and mules in the Sudan, namely,

primary interstitial pneumonia. The causal organism was identified as *C. farcinimosus*, which is also responsible for epizootic lymphangitis [*R.A.M.*, viii, p. 309].

McCrea (Adelia). **Parasitic fungi of the skin.**—*Journ. Trop. Med. & Hygiene*, xxxiv, 14, pp. 204–206, 1931.

For some time the writer has been engaged, at the Parke Davis Research and Biological Laboratories, Detroit, Michigan, on a study of the dermatophytes with the following objects: (1) isolation of causal organisms and their identification, at any rate within the genus; (2) development of an antigenic or immunizing agent; (3) inoculation of guinea-pigs to permit of comparative treatments of the resulting lesions; and (4) recurrence or reinfection, with reference to the persistence of the fungus in the tissues (in conjunction with R. C. Jamieson).

About 180 cases were investigated, a good percentage of which yielded pure cultures. The organism most prevalent in ringworm of the hands and feet was found to be *Trichophyton interdigitale* [*T. mentagrophytes*: *R.A.M.*, x, p. 243], followed by *E.* [*T.*] *rubrum* [loc. cit.] and other species of *Epidermophyton*. Only a few cultures of *Microsporon* were obtained. So far the prospects of immunization are not very encouraging, but this phase of the work is still in progress. Guinea-pigs readily developed typical ringworm lesions, usually within a week after inoculation. Spontaneous healing usually occurs in about a month, a period sufficient for the testing of local treatments. Infection of the same area on three successive occasions has frequently been produced with *E. inguinale* [*E. floccosum*: loc. cit.], the lesions in such cases being so severe as to indicate that no appreciable immunity follows infection.

Haines (R. B.). **The growth of micro-organisms on chilled and frozen meat.**—*Journ. Soc. Chem. Ind.*, l, 27, pp. 223T–227T, 2 graphs, 1931.

In the course of experiments at the Low Temperature Research Station, Cambridge, it was observed that the surfaces of carcasses of mutton and lamb showed visible yeast and mould growth after prolonged storage at –5° C. [*R.A.M.*, i, p. 60]. This temperature is evidently not sufficiently low to inhibit microbial development, but at –10° all growth ceases. An actively motile bacillus of the *Pseudomonas* group, measuring 1 to 1·5 by 0·5 μ, was found to be responsible for the spoilage of chilled beef stored at 0°. It was shown by biochemical studies that appreciable changes occur in the 'soluble nitrogen' of beef (minced or in small slabs) at 0° under optimum conditions for the growth of micro-organisms, whereas at –3° and –5° such modifications were slight.

Staner (P.) & Verplancke (G.). **Un état pathologique du Sisal au Congo Belge.** [A pathological state of Sisal in the Belgian Congo.]—*Bull. Agric. Congo Belge*, xxi, 3, pp. 864–866, 1930. [Received September, 1931.]

This paper, describing a physiological leaf spot of sisal (*Agave rigida* var. *sisalana*) in the Belgian Congo, is a shorter version of one already noticed from another source [*R.A.M.*, x, p. 383].

ECCLES (J.). **Mildew growth on cellulose acetate fabrics.**—*Textile Manufacturer*, lvii, 677, p. 184, 1 fig., 1931.

Mould growths may occur on dyed or undyed cellulose acetate artificial silk fabrics, from which species of *Aspergillus*, *Rhizopus*, *Penicillium*, *Mucor*, *Fusarium*, and *Alternaria* have been isolated and cultured [cf. *R.A.M.*, x, p. 597]. No actual breakdown of the fibre has yet been observed, as in cotton and wool, but though there have been suggestions that the growth of the moulds is due to the presence of gelatine in the size, residual soap, and the like, most of these gave negative results on examination. A broken filament was found near each spot, and it is thought that such filaments, which are subject to considerable agitation in air during manufacturing processes, develop a high potential and exercise a strong attractive force on dust particles, in which the moulds may originate. Disappointing results were obtained with various new antiseptics [cf. ibid., x, p. 598].

RIPPEL (A.) & KESELING (J.). **Tannin-decomposing micro-organisms.**—*Arch. für Mikrobiol.*, *1930*, i, pp. 60–77, 1930. (German.) [Abs. in *Brit. Chem. Abstracts*, A, p. 1094, September, 1931.]

Of a number of moulds examined, only *Penicillium*, *Citromyces*, and *Aspergillus* spp. were able to utilize tannin as a sole source of carbon. Tannase production by fungi occurred only in the presence of tannin, but was not associated with the ability to utilize this substance.

GRIEVE (B. J.). **Rose diseases and their control.**—*Journ. Dept. Agric. Victoria*, xxix, 5, pp. 249–253, 3 figs., 1931.

The three diseases dealt with in this final instalment of the author's series of articles on rose diseases [*R.A.M.*, x, p. 523] are stated not to have been so far recorded from Australia. They are rose graft disease (*Coniothyrium fuckelii*) [*Leptosphaeria coniothyrium*: ibid., viii, p. 648; ix, p. 722], crown canker (*Cylindrocladium scoparium*) [ibid., vii, p. 446], and cane blight (*Botryosphaeria ribis* [var.] *chromogena*) [ibid., vii, p. 446; ix, p. 344].

DODGE (B. O.). **A further study of the morphology and life-history of the Rose black spot fungus.**—*Mycologia*, xxiii, 6, pp. 446–462, 2 pl., 1931.

Infection by the causal organism of black spot of roses (*Diplocarpon rosae*) [see next abstract] occurs directly through the leaf cuticle. The superficial, primary mycelium is subcuticular, the hyphae forming a network and tending to be associated in fascicles composed of several parallel filaments radiating from the point of infection. The internal mycelium is intercellular. The haustoria are simple, uninucleate structures, usually with a conspicuous, thick, cup-shaped stalk and a fairly distinct sheath; they are most prominent in the epidermal and palisade cells.

The summer acervuli, occurring chiefly on the upper side of the leaf, are subcuticular, and contain bicellular hyaline conidia, 18 to 25 by 5 to 6 μ, constricted at the septum, arising from short inconspicuous cells of the thin basal stroma. Subcuticular spermogonia or micro-acervuli also develop on the black spots, usually on the

upper side of old leaves, in March or April. The uninucleate spermatia measure 2 to 3 μ in length and resemble minute spores; they are abstricted from bicellular stalks simulating the conidia except that they are smaller and taper upwards. Sometimes the spermogonia contain normal bicellular conidia. Internal, deep-seated acervuli develop on old leaves early in April in a stroma situated between the upper epidermis and the palisade cells, or occasionally in the spongy parenchyma on the lower leaf surface; they are capped by a mass of thick-walled, brown cells. The first conidiophores are filamentous and generally three or four cells long, the upper two being cut off as a true bicellular conidium. In old fruit bodies the conidia have a single stalk cell or arise directly from the sporogenous tissue cells, two or three spores often arising from the same cell without individual stalks. The conidia are hyaline, 20 to 25 by 5 to 6 μ, the upper cell usually thicker, not noticeably constricted at the septum; they are extruded in a whitish mass as the fruit body ruptures.

DODGE (B. O.). **A further study of the morphology and life-history of Rose black spot fungus.**—*Torreya*, xxxi, 4, pp. 126–127, 1931.

Good control of black spot of roses (*Diplocarpon rosae*) is stated to be obtainable by the application of pomogreen [see next abstract], a sulphur preparation dyed the colour of the average rose leaf which imparts no unsightly discoloration to the foliage. This preparation is available with or without the admixture of 10 per cent. lead arsenate.

The writer's cytological studies of *D. rosae* are noticed from another source [see preceding abstract].

MASSEY (L. M.) & PARSONS (B.). **Rose disease investigations. Second progress report.**—*Amer. Rose Ann., 1931*, pp. 65–80, 1 diag., 1931.

Details are given of experiments conducted during 1929 and 1930 by the American Rose Society in co-operation with Cornell University on the control of brown canker and black spot of roses (*Diaporthe umbrina* and *Diplocarpon rosae*) [*R.A.M.*, viii, p. 648; x, p. 666 and preceding abstract]. The latter fungus was severe in 1929 and moderately so in 1930. The best results in both years were given by the sulphur dusts, kolotex, kolodust [ibid., ix, p. 326], pomogreen, and green kolodust, the two last-named having the additional advantage of causing little or no discoloration of the foliage. Bordeaux mixture and lime-sulphur proved less efficacious, especially in 1929, when no spreader was used; in 1930 the admixture of soap or kayso improved the adhesive capacity of these fungicides. Brown canker occurred to a limited extent in 1930 only; the few available data indicate that good control may be obtained with sulphur-containing preparations.

LAUBERT (R.). **Neue Pilzkrankheit der Rosenzweige.** [New fungous disease of Rose twigs.]—*Gartenwelt*, xxxv, 28, pp. 382–384, 3 figs., 1931.

Climbing rose shoots of the Konrad Heinrich Söth variety sub-

mitted to the writer from an unspecified locality in Germany showed circular spots on the nodes round the eyes and occasionally on the internodes. The lesions measured 0·5 to 2·5 cm. in diameter and extended half or three-quarters, sometimes all round the twig; they were dark brown or leather-coloured in the centre, almost black at the edge, and usually surrounded by a broad, indistinct, dull crimson border. The eyes situated in the middle of the lesion were mostly dead.

Microscopic examination of diseased material after a day in the moist chamber showed that the minute points visible to the naked eye in the centre of the lesions consisted of spore masses originating below the stomata of the shoots. The brown, necrotic cortical tissue was traversed by sinuous, hyaline, branched, septate hyphae, 2 to 4 μ in thickness. In the air-chambers below the stomata colourless stromata develop from which bundles of conidiophores, 30 to 60 μ long, emerge through the stomata. The conidia abstricted from the conidiophores are unicellular, hyaline, thin-walled, elongated, with rounded ends, generally straight, containing pale vacuoles of varying size; they measure 8 to 15 (sometimes up to 18) by 3 to 5 μ. The fungus is provisionally named *Myxosporium vogelii*, n. sp. None of the many other rose varieties growing in proximity to the above-named kind was affected by the disease.

FEEKES (F. H.). **Onderzoekingen over schimmelziekten van bolgewassen.** [Investigations on fungous diseases of bulbs.] —*Thesis, Univ. of Utrecht*, 93 pp., 10 figs., Baarn, Hollandia-Drukkerij, 1931. [English summary.]

Daffodil (*Narcissus pseudo-narcissus*) bulbs from the Dutch bulb-growing districts, examined in 1929 and 1930, showed a disease which proved to be due to a *Fusarium*, identified by Wollenweber as *F. orthoceras* [*R.A.M.*, viii, p. 215]. Affected bulbs were chocolate-coloured, blackish- or reddish-brown at the base. Between the scales was a white mycelium, sometimes accompanied by a pink stromatic mass bearing conidia, which proved to be viable after a year on an old, shrivelled bulb. The healthy white portions of the bulb show black dots, representing discoloured vascular bundles. The discoloration progresses most rapidly on the inner side of the scales.

The diseased tissues contain the hyphae of the fungus immediately below the epidermis. In some cases an attempt at suberization is made by the parenchyma cells bordering on the mycelium, and the progress of the fungus may be temporarily arrested. In a more advanced stage of infection the hyphae may be observed penetrating the adjacent parenchyma and in the vascular bundles. Most of the conidia (68 per cent.) were found to be non-septate and measured 3 to 11 by 1·5 to 4 μ (average 7·3 by 2·9 μ); 22 per cent. were uniseptate and 9 to 19 by 3 to 4·5 μ (average 12·7 by 3·7 μ), the remaining 10 per cent. being triseptate and 20 to 34 by 3·5 to 4·5 (average 27·4 by 4·3 μ). No sporodochia or pionnotes are produced. The macroconidia are characterized by a foot and by a curved apical cell ending in a blunt point; terminal and intercalary chlamydospores occur in large numbers.

Positive results were given by inoculation tests [which are fully described] both on plants growing in infected soil and on stored bulbs. In the former case the plants developed curved and damaged leaves which wilted prematurely. The most susceptible variety was Madame de Graaf and the least so Golden Spur, while Leedsii, Mrs. Langtry, and double von Sion were intermediate in resistance.

The results of the author's investigations on the root rot of daffodils and hyacinths caused by *Cylindrocarpon radicicola* and *F. culmorum*, respectively, are stated to agree in the main with those of Gerretsen and his collaborators [see next abstract], their studies having evidently been made on the same diseases, which present similar symptoms on the two hosts. The yellow to brown stripes on the roots measure 1 to 10 by 0·5 mm. In advanced stages of the disease nothing is left but a skin composed of the epidermis and the underlying cell layer, the remainder of the root tissue being completely rotted. The hyphae of *C. radicicola* measure up to 4 μ in diameter and the yellowish-brown to brown chlamydospores 10 to 16 μ, with a wall 1 to 1·5 μ thick. In *F. culmorum* the hyphae are 1·5 to 3 μ thick and the hyaline to very pale yellow chlamydospores measure 8 to 12 μ in diameter, the wall being 0·5 to 1 μ in thickness. Cross-inoculation experiments showed that *C. radicicola*, which the author also isolated from narcissi (*N. poeticus*), is unable to produce the root-rotting symptoms on hyacinth, while *F. culmorum* cannot cause the *Narcissus* root rot. In the case of plants naturally infected by these fungi there was no rotting of the bulbs in storage, the rot being confined to the roots, and inoculation experiments on *Narcissus* bulbs also gave negative results; storage rot occurred, however, when hyacinth bulbs were inoculated with *F. culmorum*.

Phyllosticta narcissi (originally described by Aderhold on *N. poeticus*) was isolated from uninjured daffodil bulbs (especially of the Leedsii varieties), the grey mycelium growing between the healthy scales, and on the yellow, shrivelled leaves. The same organism was isolated from the scapes of *Hippeastrum vittata*. The relationships between *P. narcissi*, *P. gemmipara* [ibid., viii, p. 649], and *Phoma amaryllidis* [ibid., viii, p. 579] are fully discussed and set forth in tabular form. The conclusion is reached that *Phyllosticta narcissi* and *P. gemmipara* are certainly identical, the former name having priority, while *Phoma amaryllidis* is also probably the same. Inoculation experiments with the three organisms produced the same effects on both hosts. *Stagonospora curtisii* is believed also to be probably identical [cf. ibid., ix, p. 318; x, p. 434].

The results of inoculation experiments on onion bulbs stored at 26·8° C. with 32 species of *Fusarium* (23 of which are stated by various authors to have been isolated from the same host) are discussed and tabulated. Twenty species, including *F. avenaceum*, *F. bulbigenum* [ibid., ix, p. 623], *F. cepae* [ibid., x, p. 429], *F. coeruleum* [ibid., ix, p. 380], *F. cromyophthoron* [ibid., ix, p. 155], *F. fructigenum*, *F. lini*, *F. malli*, *F. martii*, *F. orthoceras* var. *triseptatum*, *F. oxysporum*, *F. radicicola*, *F. rhizochromatistes* [loc. cit.], *Gibberella moniliformis*, and *G. saubinetii* produced bulb rot.

GERRETSEN (F. C.), HISSINK (D. J.), VOLKERSZ (K.), & ZIJLSTRA (K.). **Een onderzoek naar de oorzaken en de bestrijding van het z. g. n. van den wortel gaan van Narcissen en Hyacinthen.** [An investigation of the causes and control of the so-called root decline of Narcissi and Hyacinths.]—*Versl. Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations*, xxxii, pp. 302–384, 24 pl., 1 diag., 3 graphs, 1927. [English summary.]

A comprehensive account, accompanied by 45 tables, is given of the authors' investigations on the etiology and control of the root rot of narcissi (*Narcissus poeticus*), daffodils [*N. pseudo-narcissus*], and hyacinths [cf. preceding abstract], which first attracted attention in Holland about 1917. No correlation could be traced between the occurrence of root rot and the chemical components or hydrogen-ion concentration of the soil.

The disease first appears in the early stages of the growth of the bulbs, but the symptoms are most conspicuous at the close of vegetation, i.e., during the period of greatest evaporation. The tips of the leaves turn yellow and the size of the affected plants is greatly reduced as compared with that of the healthy ones, which may still be green when the others are completely withered. The root system of the diseased plants is largely decayed. Small brown spots appear on the roots, and these enlarge and finally involve almost the whole root system, though the bulbs remain healthy and can produce sound crops if replanted the following year in a healthy garden. The symptoms reappear year after year on the same patches, usually spreading slowly. The root rot is most prevalent in fields where the same crop is grown repeatedly, but it may also develop in virgin soil. The most susceptible varieties are *N. poeticus ornatus*, *N. pseudo-narcissus bicolor* Victoria, followed by Emperor, Glory of Leyden, Madame de Graaf, Ajax, and Madame Plemp, while among hyacinths the fine-rooted varieties are the most susceptible, e.g., Gertrude, Queen of the Pinks, and Yellowhammer. Tulips do not appear to suffer from this disease.

The centre of the above-mentioned brown spots consists of dead cells with suberized walls, frequently containing fungal hyphae. The fungus traverses the epidermis and reaches the short exodermis cells, whence it spreads to the neighbouring parenchyma, inducing in advance of its progress the formation of a layer of wound cork. The septate hyphae vary from less than 2 to 4 μ in diameter, and globular spores with a yellowish-brown, granular content, about 15 μ in diameter, are sometimes found in the cortical parenchyma cells. The authors were unable to obtain pure cultures of the fungus for purposes of inoculation, but all the available evidence implicates it as the agent of the root rot. Indirect proof in favour of this view was further afforded by sterilization of the soil by heat or formalin, which resulted in satisfactory development of the bulbs.

Of the various soil disinfectants studied, formalin at a concentration of 0·5 per cent. proved most efficacious. The spread of the disinfectant through the soil was followed by means of paraffined paper cylinders, which were filled with the soil and cut into uniform disks some time after the application of the fungicide. The

determination of formalin at varying depths and counts of the bacteria and fungi in the corresponding layers showed that the toxicity of this substance did not extend beyond 21 cm. after 24 hours, but that better results could be obtained at greater depths by watering some hours after applying the formalin, even with one-third of the original quantity of disinfectant. The addition of a 2·4 per cent. solution of formaldehyde caused the death of 96·9 per cent. of the soil bacteria and 94·6 of the fungi in 24 hours at a depth of 3 to 6 cm. below the surface. The heavy vapours of carbon disulphide (2·5 c.c.) penetrated much deeper into the soil than any of the other disinfectants, killing 77·7 per cent. of the bacteria and 73·8 per cent. of the fungi at a depth of nearly 0·5 m. after 20 hours. Field experiments with formalin showed a very marked improvement of yield of the diseased narcissus fields, an increase of 139 per cent. being obtained in one of the treated plots. The best method of application was to spray 0·4 to 0·8 l. of 40 per cent. formalin dissolved in 10 l. water per sq. m. into the beds already dug for planting; the bulbs should then be planted immediately (with rubber gloves on the hands) and the beds covered with sand. Spraying the top sand with part of the formalin solution prevents reinfection of the sterilized subsoil. The use of formalin immediately before planting is only practicable when the roots of the bulbs are completely dormant, since severe injury or even death may occur as the result of treatment after growth has started; in the latter case the formalin should be applied at least one month before planting. Hyacinths also made much better growth on diseased soils after the application of formalin, 81·7 per cent. of first quality bulbs out of a lot of 147 being obtained from a treated area compared with 10·7 from an untreated. The beneficial effects of the formalin both on narcissi and hyacinths persisted during the year following treatment. This preparation is stated to be used on a very large scale by Dutch bulb-growers (nearly 20,000 l. in 1925), not only on diseased narcissus and hyacinth soils, but also to secure the growth of hyacinths with delicate root systems, which are generally more susceptible to disease than the ordinary varieties. Carbon disulphide, being more expensive than formalin, insoluble in water, and highly volatile, has found no practical application, while carbolineum, chloride of lime, uspulun, sulphur, and caporit ($CaOCl_2$) [*R.A.M.*, ix, p. 803] proved unsatisfactory in the control of the root rot.

BABEL (A.). **Krankheit an Dahlien.** [Disease of Dahlias.]—*Blumen- und Pflanzenbau*, xlvi, 7, pp. 101–102, 2 figs., 1931.

For the past few years dahlias in Germany have been attacked by a species of *Botrytis*, causing shedding of the petals, which fall on to the leaves and produce brown spots under humid conditions [cf. *R.A.M.*, i, p. 7]. The flowers generally fail to develop, being transformed in the bud stage into a rotten liquid mass bearing the mycelium of the fungus. Spraying the plants with 0·3 per cent. soft soap solution or 0·75 per cent. solbar gave promising results, the latter being particularly effective in the open. Cultural precautions are also briefly indicated.

DELLINGER (O.). **Wirksame Bekämpfung von Krankheiten und Schädlingen der Nelken.** [Effective control of Carnation diseases and pests.]—*Möllers Deutsche Gärtnerzeit.*, xlv, pp. 404–405, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxiv, 8–14, pp. 321–322, 1931.]

Carnation rust [*Uromyces caryophyllinus*: *R.A.M.*, ix, pp. 508, 654] is stated to be most prevalent in Germany on late sown plants in warm, closed greenhouses. Good control has been given by dusting with air-slaked lime mixed with $\frac{1}{10}$ sulphur, followed, after the lapse of several days, by thorough rinsing and watering.

HOWARTH (W. O.) & CHIPPINDALE (H. G.). **On some fungi occurring on Rhododendrons.**—*Mem. & Proc. Manchester Lit. & Phil. Soc., 1930–31*, 7, lxxv, pp. 95–103, 1 pl., 1 diag., 1931.

This is an expanded account of the writers' investigations of the high mortality, due to defective grafting and the use of unsuitable stocks, of hybrid rhododendron bushes at Manchester, associated with the presence, in a purely saprophytic capacity, of *Pestalozzia macrotricha* and *Diplodia eurhododendri* [*R.A.M.*, ix, p. 318].

PETRAK (F.). **Beiträge zur Kenntnis einiger Pilzkrankheiten der Kakteen.** [Contributions to the knowledge of some fungous diseases of Cacti.]—*Zeitschr. für Parasitenkunde*, v, 2–3, pp. 226–249, 2 figs., 1931.

Seedlings of *Cereus*, *Echinocactus*, *Mamillaria*, and *Echinocereus* spp. in a nursery at Weisskirchen (Czecho-Slovakia) were attacked in 1928 and 1929 by a new species of *Helminthosporium* to which the name *H. cactivorum* is given, with a diagnosis in Latin. The fungus, which causes a dirty grey, ultimately greenish-black discoloration and shrivelling or entire collapse of the plants, is characterized by subhyaline or greyish-brown, indistinctly septate hyphae, 2 to 7 μ in width; almost straight, pale olivaceous to greyish-brown, 2- to 4-septate conidiophores, 30 to 280 by 4 to 7 μ, usually thickening abruptly at the irregularly dentate apex or dividing into 1 to 3 short, undulating branches at this point; and elongated to clavate, fusoid, ovoid, or ellipsoid, brownish-olive, 2- to 4- or rarely 5-septate, straight or irregularly curved conidia, 12 to 75 by 6 to 13 μ, with an epispore about 0·5 μ in thickness.

Inoculation tests [the results of which are described and tabulated] in 1930 showed that *H. cactivorum* is pathogenic to a number of species of the above-mentioned genera. Control measures, including thin sowing of the seed, immediate removal of infected material, and spraying with Bordeaux mixture, are discussed at some length.

In the same nursery a three-year-old *Astrophytum myriostigma*, a number of seedlings of *Cephalocereus senilis*, *Echinocactus* spp., *Cereus* spp., *Echinopsis ducis* Pauli, and *Melocactus depressus*, as well as some of *C. jamaracu*, were severely attacked by a watery stem rot due to a species of *Fusarium* possibly identical with *F. blasticola*. The exterior of the stem base was covered by a flocculent mycelium, composed of densely interwoven fairly straight hyphae, up to 5 μ in width. The conidiophores are often very

short and indistinct, consisting merely of a minute, bluntly conical papilla barely 2 μ in length; they may, however, be awl-shaped or narrowly cylindrical, tapering at the apex, and up to 30 μ long. The conidia are very variable, some being unicellular, rod-shaped or cylindrical, clavate, fusiform, straight or slightly curved, 5 to 14 by 1·5 to 2·5 or 3 μ, while others are uni- to triseptate, very narrow, elongated-fusiform or navicular, mostly curved, and measuring 15 to 33 by 2 to 3·5 μ. The conidia do not appear to be formed under natural conditions, but develop in three days in a moist chamber.

In 1928 the writer examined an *Echinocactus quehlianus* plant showing a dark grey to blackish discoloration of the stem base, which was encircled by horizontal to irregular, prominent folds separated by deep, furrowed grooves. On the darkened areas densely aggregated, convex fruit bodies formed a subepidermal stromatic tissue, 40 to 70 μ in thickness, composed of very dark cells, 7 to 12 μ in diameter. The numerous loculi in this stroma were spherical or oval, 80 to 100 μ in diameter, and contained clavate, thick-walled, immature asci measuring 60 by 8 μ, which failed to develop further, so that the fungus could not be identified.

Opuntia diademata var. *papyracantha* in the Weisskirchen district is liable to a peculiar type of scab. The shoots are more or less covered by dark leather-coloured or reddish-brown spots, which gradually become pale and are delimited by a greyish- or brownish-green, often slightly raised line. Later the lesions sink and their surface becomes wrinkled, while fissures develop at the edges and the spots are torn away. An extensive wound periderm is formed 1 to 1·5 mm. below the lesion, the tissue external to which shrivels and finally assumes a granular or powdery consistency, the primary cortex being shredded off. In a few of the lesions a compact stroma developed, with numerous sterile loculi, 60 to 150 μ in diameter. The mycelium was composed of thin-walled, olive-brown hyphae, 2 to 7 μ in width. The fungus is thought to belong to the Dothidiaceae, being possibly a species of *Melanops*, *Botryodiplodia*, or *Dothiorella*.

In 1930 a species of *Botrytis* was observed to cause a watery rot of various species of *Mamillaria*, *Echinocactus*, *Cereus*, *Mesembryanthemum*, *Aloe*, *Crassula*, *Agave*, *Stapelia*, and *Opuntia*, the resistance of which had been lowered by unsuitable cultural conditions.

Wright (J.) & Leach (R.). **Fusarium wilt disease of Sunn Hemp. I.**—*Trop. Agriculture*, viii, 6, pp. 151–160, 3 graphs, 5 charts, 1931.

A detailed account is given of the authors' investigation of the wilt disease of sunn hemp (*Crotalaria juncea*), which was first described from Trinidad by Briant and Martyn [*R.A.M.*, ix, p. 186]. Cultural studies of the causal organism render it probable that it is a biological strain of *Fusarium vasinfectum*: on various media it soon produced an abundance of micro- and macroconidia, and later chlamydospores and minute sclerotia were formed. The macroconidia ranged in size from 18·3 to 54·8 by 2·9 to 4 μ (average 33·4 by 3·7 μ), and their septation varied from one to

five, 75 per cent. of the spores being triseptate. On initially acid or alkaline media the fungus reduced the acidity or alkalinity of the substratum.

Experiments were made on land on which in the previous year sunn hemp had shown a high percentage of infection with wilt, to determine the effect of the water content of the soil, of liming, and of manurial treatment on the incidence of the disease, and observations were made every second day up to the time of harvest. The first symptoms appeared when the plants were one month old, and with one single exception, the disease was initially confined to the areas which had been planted to the same crop in the foregoing year; towards the end of the experiment, however, the infection was general throughout the crop, the plots farthest removed from the initial foci showing the lowest incidence of wilt. Although the application of lime did not produce any statistically significant difference in the incidence of the disease, there was some evidence that the treatment may be beneficial. Lime at the rate of 10 tons to the acre only altered the reaction of the soil from P_H 6 to 6·2 on the unlimed portion to 6·4 to 6·6 on the limed plots; this did not affect the P_H value of the plant sap, which remained constant at 6·5 in all the plants examined. Manurial treatment did not appear to have any significant influence on the disease.

In pot experiments to determine the infective power of fresh macroconidia of *F. vasinfectum*, the first plant wilted 23 days after inoculation, and by the end of three and a half months almost all the plants had succumbed to wilt, the causal organism being recovered from them. Inoculation tests with seed germinated on moist filter-paper showed that 48 hours after inoculation the fungus had penetrated to a considerable distance into the tissues of the seedlings, and in some instances had killed off several cells; the root tips of such seedlings died, but adventitious roots were produced, and the plants developed normally for some time. The shortest time from inoculation to the appearance of wilt was 16 days, the longest 34 days, and the average 24 days.

MAIRE (R.). **Algeria: Rhizoctonia medicaginis.**—*Internat. Bull. of Plant Protect.*, v, 7, p. 113, 1931.

Rhizoctonia medicaginis [*Helicobasidium purpureum*], a new record for North Africa, has developed in the lucerne crops in two places in Algeria.

LAUBERT (R.). **Ueber die verschiedenen Formen des Apfelschorfes.** [On the various forms of Apple scab.]—*Obst- und Gemüsebau*, lxxvii, 7, pp. 115–116, 1931.

The writer briefly recapitulates his observations on the three forms of apple scab (*Venturia inaequalis*) occurring in Germany, viz., ordinary summer scab, autumn scab (in which the disease suddenly appears on hitherto sound fruit), and black pitting or storage scab [*R.A.M.*, x, p. 38]. Wiesmann's investigations on the last-named disease in Switzerland [ibid., x, p. 320 and next abstract] are concisely summarized.

Faes (H.) & Staehelin (M.). **L'apparition et le développement de la tavelure tardive sur les Pommes de garde.** [The appearance and the development of late scab on stored Apples.]—*Ann. Agric. de la Suisse*, xxxii, 2, pp. 167–201, 7 figs., 8 graphs, 1931.

Observations and experiments (1929 to 1931) on late scab of apples (*Venturia inaequalis*) at Lausanne have conclusively shown that certain varieties, e.g., Citron d'Hiver and Franc Roseau, are liable to develop scab in storage even if in apparently perfect condition at harvest time [*R.A.M.*, x, p. 526]. They must, therefore, already be in the incipient stage of infection when placed in storage.

The lesions of *V. inaequalis* on stored apples are characterized by a suberized, sterile central zone, a peripheral sporiferous zone, and a zone of infiltration of the fungus situated still further out. The conidia of the fungus may be found on fruit in the storage rooms throughout the winter months. From February onwards various organisms responsible for apple rot, e.g., *Penicillium*, *Botrytis*, and *Gloeosporium*, penetrate the fruit through the scab lesions.

Although it is theoretically possible for the scab fungus actually to infect the fruit in the storage room, in practice the requisite conditions are seldom likely to be realized. In the writers' experiments the conidia of *V. inaequalis* were never found in the air of the storage rooms, the presence of drops of water being necessary to detach them from the host. It is far more probable that the apples are infected while yet on the tree, the lengthy incubation period (four to six weeks) accounting for the belated appearance of the symptoms. Evidence of intraepidermal penetration prior to storage is afforded by the development of the lesions on disinfected apples, e.g., those immersed in 70 per cent. alcohol, 1 per cent. copper sulphate, 1 per cent. formalin, or 2 per cent. lime-sulphur, all of which inhibit the germination of the conidia of *V. inaequalis* in the laboratory.

The control of this form of scab should be based on the selection of resistant varieties, supplemented by fungicidal treatment shortly before the harvest.

Arnaud (G.) & Barthelet (J.). **Une maladie nouvelle des Pommes : le blotch fumeux (Gloeodes pomigena Colby).** [A new disease of Apples: sooty blotch (*Gloeodes pomigena* Colby).]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 3–4, pp. 81–86, 1 pl., 1931.

During 1930, mainly owing to the heavy rains which prevailed, sooty blotch of apples (*Gloeodes pomigena*) [*R.A.M.*, ix, p. 460] was very prevalent in certain parts of France, where it appears to have been known in the west of the country for eight or nine years. It is particularly rife in the damp forest area of la Vendée. Bordeaux mixture and the lime-sulphur sprays act as effective preventives but the usual applications made against scab [*Venturia inaequalis*] require to be supplemented by an extra spray in July and possibly another in August. The black fungal layer on the surface of

the fruit is best removed by rotating or brushing in sawdust and water.

Fisher (D. F.) & Reeves (E. L.). **Arsenical and other fruit injuries of Apples resulting from washing operations.**—*U.S. Dept. of Agric. Tech. Bull.* 245, 12 pp., 3 pl. (2 col.), 1931.

A description is given of the calyx scald of apples which, since 1927, when chemical solvents were first used in commercial fruit-washing operations in the Pacific Northwest, has become prevalent in that region. In some cases the losses have amounted to 60 per cent. within three or four weeks after washing [cf. *R.A.M.*, viii, p. 50].

Calyx scald was found to be primarily due to the presence of soluble arsenic on the fruit. The thorough rinsing of the apples prevents the accumulation of this compound, but since copious quantities of fresh water are not always available it is sometimes necessary to add lime to the rinsing water (3 lb. hydrated or 2 oz. quicklime per 100 galls.).

Fungous spores frequently penetrate the open calyx tubes of the washed Jonathan, Esopus Spitzenburg, Stayman Winesap, Ortley, and Delicious varieties, being introduced with the washing solutions and so causing core rot. The accumulation of spores in the machinery may be reduced by discarding solutions after each day's run or after washing about 1,000 bushels, scrubbing the machine with clean water, and disinfecting with live steam or formalin (1 pint per 100 galls. of solution), the latter being pumped through the machine for five or ten minutes and allowed to stand overnight.

Wallace (T.). **Chemical investigations relating to potassium deficiency of fruit trees.**—*Journ. Pomol. and Hort. Science*, ix, 2, pp. 111–121, 1931.

Details are given of chemical experiments which showed that the potassium deficiency associated with leaf scorch in fruit trees and bushes [*R.A.M.*, vii, p. 522; x, p. 738] is reflected in the chemical composition of all the different organs and parts of the plants affected (with the exception of the stones of plums), the percentage of dry matter in fresh weight being usually increased, and the ash content, as well as the potash content in ash and in dry matter, being greatly decreased. The investigation also indicated that the use of plant varieties resistant to leaf scorch is not likely to overcome potassium deficiency in the field. There was evidence that in cases where plants had failed to respond to applications of dung or potash manures, the amounts of potassium taken up by them from the dressings were inadequate.

Haase (F.). **Die Blattbräune und Schrotschusskrankheit der Süsskirschen in Oberbaden.** [Leaf browning and shot hole of sweet Cherries in Upper Baden.]—*Obst- und Gemüsebau*, lxxvii, 7, p. 113, 1931.

The leaf scorch disease of sweet cherries caused by *Gnomonia erythrostoma*, which first became prevalent in Upper Baden in 1922 and reached a climax in 1925 [*R.A.M.*, vii, p. 35], is stated to

have been the cause of immense damage. In 1925 and 1926 shot hole (*Clasterosporium carpophilum*) [ibid., x, p. 527] began to gain the upper hand, and soon prevented any further development of *G. erythrostoma* by destroying the leaves on which the latter used to overwinter in the tree crowns. Shot hole was less in evidence after the dry spring seasons of 1928 and 1929, but in 1930 it again caused exceedingly heavy losses, involving 80 to 95 per cent. of the crop. Excellent control was given by two applications before the blossoming of nosprasen or nosprasit (0·75 and 1 per cent.), followed by two post-blossom applications of the same preparations at 0·5 and 0·35 per cent. In some cases 1 per cent. solbar or 2 per cent. lime-sulphur were substituted for the abovementioned at the third application. A dormant spray of 8 per cent. carbolineum also proved beneficial.

BRATLEY (C. O.). **Decay of sweet Cherries from California.**—*Plant Disease Reporter*, xv, 7, pp. 73–74, 1931. [Mimeographed.]

A species of *Cladosporium* was isolated from about 1·5 per cent. of the sweet cherries in two consignments sent from California to the New York market during June 1931. The fungus was characterized by small white tufts of aerial mycelium, later turning olive-green, and it caused the development of a tan-coloured, conical rot, somewhat resembling that due to *Alternaria* but differing in its paler colour, firmer consistency, slower rate of growth, and less extensive aerial mycelium. *Sclerotinia fructicola* [*S. americana* : ibid., viii, p. 553] was responsible for the bulk of the loss in the shipments examined during the month, while other fungi involved in the causation of decay included species of *Rhizopus*, *Penicillium*, *Botrytis*, and *Aspergillus*.

ZUNDEL (G. L.). **New or unusual symptoms of virus diseases of Raspberries.**—*Phytopath.*, xxi, 7, pp. 755–757, 3 figs., 1931.

An unusual type of mosaic, designated 'fern-leaf', was observed in the spring of 1929 in an old planting of Cumberland raspberries at Wernersville, Pennsylvania. The leaves were dwarfed and the interveinal tissue was wrinkled and unusually dark green. The serrations of the leaflets were accentuated and all parts of the affected plants, including the canes, were very brittle, while the fruit was dwarfed, dry, crumbly, and tasteless. Adjoining the diseased plots were patches of cucumber and melon, and the 'fern-leaf' symptoms are thought probably to result from infection of the raspberries by cucurbit mosaic, as Mogendorff has shown in the case of tomato 'fern-leaf' (which closely resembles that of the raspberry) [*R.A.M.*, ix, p. 418].

In July, 1930, a Cumberland raspberry plant at Ridgway, Pennsylvania, showed a large number of spindle sprouts, many of them 12 inches long, forming a witches' broom type of growth. The berry crop produced by this plant was unusually large, the fruit being dry and bitter. The canes were blue and many of the leaves showed the downward curling of the tips characteristic of

streak [ibid., x, p. 530], of which the spindle sprouts are believed to be an unusual manifestation.

JANSON. **Zur Frage des Himbeerrutensterbens.** [On the problem of Raspberry cane blight.]—*Prakt. Ratgeber im Obst- und Gartenbau*, xlv, p. 524, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxiv, 8–14, p. 338, 1931.]

It is still uncertain whether the Preussen raspberry variety, which is highly resistant to cane blight (*Didymella*) [*applanata*] in Germany, can become a completely satisfactory substitute for the extremely susceptible Marlborough [*R.A.M.*, ii, p. 128; ix, p. 663, *et passim*]. In some districts the prevalence of the disease seems to be declining. Infection is favoured by nitrogenous fertilizers, including green manures.

HARRIS (R. V.). **Raspberry cane spot: its diagnosis and control.**—*Journ. Pomol. and Hort. Science*, ix, 2, pp. 73–99, 6 pl., 1931.

After a brief description of the disease symptoms caused by *Plectodiscella veneta* on raspberry canes in England, the author gives a detailed account of experiments in its control from 1926 to 1929, inclusive, at the East Malling Research Station, the results of which confirmed the efficacy previously reported of one delayed-dormant and one pre-blossom application of (*a*) lime-sulphur (1 in 10 or 1 in 15 and 1 in 40, respectively) or (*b*) Bordeaux mixture (12–12–100 and 6–6–100, respectively) [*R.A.M.*, vii, p. 649; viii, p. 546; cf. also x, p. 393]. Of the two sprays Bordeaux mixture was proved to be the safest and most reliable, since under certain seasonal conditions the lime-sulphur caused direct injury to the canes and appeared also to increase their susceptibility to frost injury.

Observations during the period under review showed that the severity of the disease varies considerably from season to season, the decisive factor in this respect apparently being the amount of rainfall during the critical months from April to July. In the routine control schedule suggested, it is recommended that badly cankered and spotted canes should as far as possible be cut out and immediately burnt during the spring thinning of the stools; in seriously affected plantations this may be done after the first year's spraying as indicated above, after which, if preference is given by local growers to lime-sulphur, the risk of injury to the canes may be minimized by omitting the pre-blossom spraying. It is emphasized that to attain the best control, the raspberry plants should be sprayed regularly at least once every year.

Among the raspberry varieties grown at the Research Station, Bath's Perfection and Pyne's Royal were very definitely resistant to the disease, while in a large number of the other varieties, although the canes were commonly infected, the attack had no appreciable effect on their vigour and development. In addition to Baumforth Seedling B, which was by far the most susceptible, other varieties which exhibited a high degree of susceptibility were

Semper Fidelis A, Reader's Perfection, Devon, Red Antwerp C, and Baumforth Seedling A.

POOLE (R. F.). **Rhizoctonia crocorum on Dewberries in North Carolina.**—*Plant Disease Reporter*, xv, 8, p. 86, 1931. [Mimeographed.]

During 1929 Lucretia dewberries [*Rubus flagellaris*] in a 20-acre field in a low-lying situation near Hamlet, California, were severely stunted or killed by *Rhizoctonia crocorum* [*Helicobasidium purpureum*], cane growth being reduced to 2 ft. as compared with 4 to 12 ft. on healthy plants. In 1931 another field of three-year-old plants near Cameron was found to be similarly affected, and it is reported that dewberries grown on this area 15 years ago died in the same way. The disease, therefore, has evidently been prevalent for some time.

BROOKS (A. N.). **Anthracnose of Strawberry caused by Colletotrichum fragariae, n. sp.**—*Phytopath.*, xxi, 7, pp. 739–744, 3 figs., 1931.

Strawberry plants in central Florida have been found of recent years to be liable to anthracnose [*R.A.M.*, viii, p. 159], caused by *Colletotrichum fragariae* n. sp., an English diagnosis of which is given. The fungus produces on the runners dark-brown oval lesions, 1 to 2 mm. long, which extend for several centimetres in length and laterally until the runners are girdled. The petioles may also occasionally be affected. The disease is most prevalent during the rainy season from June to September.

C. fragariae formed a black, zonate growth in culture on artificial media, with short, cottony aerial hyphae, the conidia appearing as pink masses. After six months the cultures were found to have lost their pathogenicity. The organism is characterized by scattered, erumpent, mostly lenticular acervuli, 70 to 140 by 30 to 60 μ (average 110 by 40 μ); few or numerous setae, occurring singly or in groups, somewhat sinuous, uni- to biseptate, 97 to 142 by 3·8 to 5·4 μ (average 115 by 4·3 μ), dark brown and subbulbous at the base, lighter towards the apex, sometimes with a small, slightly constricted apical cell; hyaline, nonseptate, ovoid conidiophores, 5 to 10 by 3 to 5 μ (average 7 by 3·5 μ); and spindle- to boat-shaped, granular conidia, 14 to 21 by 3·9 to 6·3 μ (average 16·4 by 4·8 μ), with rounded ends.

Inoculation experiments with spore suspensions of *C. fragariae* on healthy potted strawberry plants gave positive results, the incubation period being considerably curtailed by wounding the epidermis of the runners and keeping the plants in a moist chamber. The younger parts of runners were further found to be more susceptible than older ones. Wounding was necessary to ensure successful infection of the leaves and petioles. The inoculation of *C. fragariae* into the runners of *Duchesnea indica* also gave positive results.

A measure of control was ensured by the application of 4–4–50 Bordeaux mixture at ten-day intervals throughout the summer.

WARDLAW (C. W.) & McGUIRE (L. P.). **The behaviour and diseases of the Banana in storage and transport with special reference to chilling.**—*Trop. Agriculture*, viii, 6, pp. 139–147, 1931.

This is a précis of the recently noticed report submitted to the Empire Marketing Board [*R.A.M.*, x, p. 607] by the Low Temperature Station of the Imperial College of Tropical Agriculture, Trinidad, where work is stated to be directed chiefly to the major problems of the West Indian banana industry, namely, the need for a substitute for the Gros Michel variety [owing to its susceptibility to *Fusarium cubense*], and the prevention of wastage in bananas during transit. In addition to the information already noticed, details are given of the fungal diseases and blemishes which were observed in mixed lots of bananas at the end of long-storage trials (24 days at 52° F., followed by a ripening period of six to eight days at 70°). Special attention was given to the following finger-tip rots. (1) A finger-tip disease caused by *Botryodiplodia theobromae* which was frequent in Gros Michel, Cavendish, and Lacatan bananas, and which appeared to originate in the decayed perianth or style, whence it spread uniformly along the fruit, causing a progressive brownish-black discoloration of the skin, sometimes involving two-thirds or even the whole of the fruit; the disease was reproduced by artificial inoculation with the organism. (2) A tip rot caused by a species of *Gloeosporium* which was much in evidence in the Cavendish and Gros Michel varieties as maturity was being approached in the ripening room; it apparently originated in the decayed perianth and slowly spread backwards from the tips for 2 cm. or more; at a later stage the brownish-black region was covered with the brownish acervuli of the fungus. Characteristic infections were obtained in healthy bananas inoculated with this strain of *Gloeosporium* isolated from typical cases of the disease. (3) Cigar-end, caused by *Stachylidium theobromae* [ibid., x, p. 324], was observed by the authors on the Cavendish (Governor) variety in Trinidad, and is stated to have been also reported from the Canaries, Gold Coast, Azores, Panama, and Queensland. The infection apparently originates in the perianth, from which it slowly spreads backwards along the finger, causing a shrinking and blackening of the skin, the diseased portion becoming covered with the powdery grey spores of the fungus; the flesh within is slowly attacked and is left in a dry, rotted condition. (4) 'Black-tip' disease (*Helminthosporium torulosum*) [ibid., ix, p. 765], originally described from Bermuda, was observed in Trinidad on the Cavendish banana, and was also isolated from spots and bruises on Gros Michel and from a black-tip disease of immature Lacatan fruits. (5) In some of the long-storage tests a tip rot of conspicuous appearance was occasionally seen in the Gros Michel variety; the first symptom was the development of a dark, watery-looking zone round the distal end of the finger, which slowly spread along the fruit for a distance of one or two inches; in the older infected regions, as maturity was reached, the skin developed a dark sooty appearance, more or less obscured by the growth of a mat of pink mycelium of velvety texture.

Isolations from the lesions consistently yielded the same species of *Fusarium*, which was not identified.

GRAHAM (J. T. T.). **Report on insecticides and fungicides.**—*Journ. Assoc. Official Agric. Chemists*, Washington, xiv, 2, pp. 121–126, 1931.

Further investigations [the results of which are tabulated and discussed] were conducted on collaborative lines during 1930 on the various methods previously reported for the determination of mercury in organic mercurial seed disinfectants [*R.A.M.*, ix, p. 258]. Methods (2) and (3) were slightly modified by the substitution of an Erlenmeyer flask closed with a small funnel for the ground-in air condenser originally specified. It was found, however, that this modification may result in incomplete oxidation and the use of a flask with a ground-in air condenser is therefore preferable. Methods (1) and (2) proved very satisfactory as regards agreement, while (3) gave somewhat erratic results, possibly on account of the slightly acid solution used for the final titration, which should, therefore, be carried out in a solution with an alkaline or neutral reaction.

BUBB (J. C.). **Method for the determination of lead and copper in Bordeaux-lead arsenate mixtures.**—*Journ. Assoc. Official Agric. Chemists*, Washington, xiv, 2, pp. 260–262, 1931.

The standard methods used by the Association of Official Agricultural Chemists for the determination of lead and copper in Bordeaux-lead arsenate mixtures are stated to require considerable time and manipulation, and the writer has therefore devised a method of separation [details of which are given] based on the insolubility of lead arsenate and the solubility of copper and calcium compounds in dilute acetic acid.

WILSON (J. D.) & RUNNELS (H. A.). **Bordeaux mixture as a factor increasing drouth injury.**—*Phytopath.*, xxi, 7, pp. 729–738, 2 figs., 1931.

The frequent occurrence of blight due to *Alternaria panax* on ginseng (*Panax quinquefolium*) plants grown on wood lots in Ohio necessitates several applications of Bordeaux mixture during the summer [*R.A.M.*, ix, p. 509]. In 1930, when the summer months were characterized by an abnormally low rainfall and excessively high evaporating power of the air, Bordeaux (3-4½-50) mixture was applied three times, on 15th and 31st May and 25th June, to a number of plants near Wooster, while others were left untreated or were sprayed or dusted with other compounds.

It was found that the Bordeaux-treated plants developed a progressive desiccation of the leaf margins from the base upwards and from the edges inwards. Finally, the leaflets became tightly curled about the petioles, which collapsed at their point of attachment to the stem.

Evidently the presence of a film of Bordeaux mixture on leaves already suffering from the semi-xerophytic condition induced by the drought increased the water loss sufficiently to exceed the critical point of desiccation, thereby rendering subsequent recovery

impossible [cf. ibid., x, p. 46]. This type of injury did not occur in the control plots, or in those where the plants were treated with compounds leaving little or no residue on the foliage.

Fifth International Botanical Congress, Cambridge, 1930. Report of Proceedings.—680 pp., 2 pl., Cambridge University Press, 1931.

Brief abstracts are given of the communications presented at the Fifth International Botanical Congress at Cambridge in August 1930. Those in the section of mycology and plant pathology include papers on virus diseases, on the effect of environment on disease, on *Septobasidium* and other entomogenous fungi, on the action of sulphur as a fungicide, on specialization in parasitic fungi, on the 'mal secco' of citrus, and on the dissemination of cereal rusts.

The following were among the resolutions passed by the Plenary Congress: (1) That this Congress considers that the Governments of all cereal-producing countries should undertake investigations on cereal rusts in order to obtain general co-operation in the breeding of resistant cereals. (2) That an International Standing Committee be appointed to deal with urgent phytopathological needs that may arise between the Fifth and the Sixth International Botanical Congress. (3) That an International Standing Committee be appointed to consider the naming and description of plant virus diseases with a view to making recommendations at the Sixth International Botanical Congress.

REDAELLI (P.) & CIFERRI (R.). **Culture of fungi on liquid media in Petri dishes.**—*Zentralbl. für Bakt.*, Ab. 1 (*Orig.*), cxxi, 5–6, pp. 370–371, 1 diag., 1931.

The authors have obtained excellent permanent preparations of different stages of anascosporous yeasts producing mycelial hyphae and spores, as well as of Endomycetaceae, by rapidly drying the culture media on open Petri dishes in a desiccator with calcium chloride. The substratum with the fungus is then divided into squares, cleared, partially softened by cedar or clove oil, and mounted in Canada balsam. Good preparations can also be obtained by culture in a Petri dish partly filled with filtered and almost colourless liquid medium. One or more clean, sterilized glass slides are placed in the dish, which is then filled up with the liquid medium. When the colonies have reached the desired stage of development, they are placed with the dish open in a desiccator with calcium chloride or anhydrous sulphide. As evaporation is rapid and uniform the colonies gently settle on the slides, which are then withdrawn and the colonies mounted in water or a dilute solution of glycerine.

SMITH (K. M.). **Virus diseases of plants and their relationship with insect vectors.**—*Biol. Reviews*, vi, 3, pp. 302–344, 1931.

A concise survey is given of all the plant virus diseases hitherto described, classified according to their hosts. An analysis is made of the various insect groups concerned in the dissemination of plant viruses, the number of virus diseases transmitted by each

group being shown. The insects are broadly divided into two categories on the basis of their feeding method (biting or sucking). Those of the former group are shown to be implicated in the transmission of only three plant viruses, the remainder being disseminated by sucking insects, viz. Thysanoptera (*Thrips*) and Hemiptera-Homoptera (Tingidae, Capsidae, Jassidae, Fulgoridae, Coccidae, Aleyrodidae, and Aphididae). The last-named have been shown to be involved in 27 cases, *Myzus persicae* alone being associated with 14 viruses [*R.A.M.*, x, p. 747].

Discussing the evidence bearing on a possible obligate relationship between the virus and insect vector, the writer concludes that it is sufficient to warrant the assumption of such a relationship in certain cases. The available information on the factors of the relationship between virus and insect vectors is also summarized and discussed. These include, amongst others, the incubation period of the virus in the insect vector; possible existence of disease or abnormality in insect vectors; longevity of the virus in the body of the insect vector; transmission of a virus by needle inoculation with the body juices of crushed infective insects; effect of sex or immaturity of the insect vector on its ability to transmit a plant virus; relationship of different individuals, strains, and varieties of insects to virus transmission; toxicity to the plant of an insect's saliva in relation to virus transmission; method of insect feeding in relation to virus transmission; apparent production of different symptoms when the same virus is transmitted by needle and insect, respectively; numerical relation between infective insects and subsequent plant infection; dissemination of viruses from plant 'carriers' by insect vectors; and transmission of plant viruses by soil-inhabiting insects.

A bibliography of 247 titles is appended.

COOK (M. T.). **The effect of mosaic on cell structure and chloroplasts.**—*Journ. Dept. Agric. Porto Rico*, xv, 2, pp. 177–181, 4 pl., 1931.

The writer has extended his studies on the effect of mosaic on cell structure and chloroplasts [*R.A.M.*, ix, p. 666] to pepper [*Capsicum annuum*], *Crotalaria striata*, *Carica papaya*, Amazon lily (*Eucharis amazonica*), and a hybrid *Amaryllis* in Porto Rico.

In the first-named plant the effects were exactly analogous with those previously observed in tobacco and tomato, except that the spread of the virus is much more rapid, corresponding to the growth of the host. In the sections of the youngest leaf of a mosaic plant of *Crotalaria striata* [ibid., x, p. 398] it was possible to distinguish at an early stage the areas that were to become chlorotic from the future green ones. In the former the cells were undifferentiated and the chloroplasts few and small, while in the latter the palisade was slightly developed and the chloroplasts more numerous and larger. In the third leaf the relative development of the chlorotic and green areas was similar. In the sections from the chlorotic part of the seventh leaf, the palisade was very poorly developed, the mesophyll open, and the chloroplasts few but about normal in size. The green area of the diseased leaf was thicker but the palisade was poorly developed and the chloroplasts

were fewer than in the normal leaf. The ninth leaf of the mosaic plant was thin and the palisade scarcely differentiated, but the chloroplasts were larger and more normal. The green area was almost normal in every respect.

Carica papaya is subject to a disease, believed to be due to a virus, which resembles that reported from Santo Domingo under the name of curly leaf [ibid., ix, p. 512 and next abstract]. Very young diseased leaves are thinner than normal ones and the palisade is not so well developed. Diseased fifth leaves are about half the thickness of normal ones, while the chloroplasts at this stage are almost equal to those of normal foliage.

The chlorotic areas of the youngest leaves of *E. amazonica* and *Amaryllis* affected by mosaic were thinner than the green ones and devoid of chloroplasts. In the third leaf both areas were thin but the green one contained numerous intercellular spaces and more chloroplasts of normal dimensions. In the two older leaves also there were more chloroplasts in the green than in the chlorotic areas.

COOK (M. T.). **New virus diseases of plants in Porto Rico.**—*Journ. Dept. Agric. Porto Rico*, xv, 2, pp. 193–195, 1931.

Further notes are given on the newly investigated virus diseases in Porto Rico, a brief account of which has already appeared [*R.A.M.*, x, p. 398]. Two plants not previously mentioned are included in the list of those subject to mosaic, viz. *Adenoropium gossypifolium* and *Ipomoea nil*. *Carica papaya* plants suffering from curly leaf [see preceding abstract] show a more or less severe and persistent curling of the foliage, accompanied by the yellow discoloration and falling of the lower leaves. Sometimes all the older leaves fall, leaving a cluster or rosette at the apex. In severe cases the fruits are reduced in number and size.

ANDRUS (C. F.). **The mechanism of sex in Uromyces appendiculatus and U. vignae.**—*Journ. Agric. Res.*, xlii, 9, pp. 559–587, 11 figs., 1931.

The author states that his observations of the development of French bean rust (*Uromyces appendiculatus*) and that of cowpea (*U. vignae*) [*R.A.M.*, iii, p. 566], following monosporidial inoculation of the host leaves with the relative organism, showed that when nectar from the pycnidia on the upper surface of the leaf was transferred by hand to the aecidiosori developing on the under side, binucleate cells appeared within 24 hours in the aecidial primordium, and on the third day the aecidia contained extended chains of aecidiospores, whereas material of the same age to which nectar had not been transferred showed no binucleate cells, except in rare cases in which the spermatia may have been possibly carried by insects. No evidence was found of the germination or fusion of spermatia. It was also shown that the two-legged basal cells in the aecidial primordium, similar to those called fusion cells by former observers, are uninucleate previous to fertilization, and they are interpreted as being essentially an egg cell composed of a foot cell and a trichogyne; the latter is a much branched and highly septate structure which terminates at the epidermis of the host

leaf, where it projects through a stoma or between two epidermal cells, and where it comes into contact with the spermatia, the contents of which enter it through a rupture of its wall. Nuclei were observed passing through the cross septa of such hyphae and migrating into the fertile cells in the aecidium. Under certain conditions parallel hyphae inside the aecidium may anastomose either prior to or after fertilization, but such fusions are believed to be purely vegetative or nutritive in function. Where all or most of the specially differentiated receptive cells in a single aecidium become fertilized there is little or no budding or branching; in cases, however, where only one or a few egg cells are fertilized, there may result an extensive proliferation which gives the appearance of central bodies and fertile hyphae, and which is made possible by fusions with unfertilized cells in the same aecidium.

These observations, which confirm in part the results obtained by Craigie in *Puccinia graminis* and some other rust organisms [ibid., viii, p. 296; cf. also x, p. 168] are believed to indicate the existence in *U. appendiculatus* and *U. vignae* of a functional sexual mechanism similar to that found in the Rhodophyceae.

LÜDTKE (M.). **Neuere Ergebnisse der Zellwandforschung und ihre Bedeutung für phytopathologische Fragen.** [Recent results of cell wall investigation and their importance in phytopathological questions.]—*Phytopath. Zeitschr.*, iii, 4, pp. 341–366, 13 figs., 1 diag., 1931.

The author precedes his account of investigations on the relations between the structure and consistency of the cell walls and pathological processes by a general survey of recent work on the structure and chemical composition of the cell membrane. In order to trace the process of destruction of the lignified cell wall by fungi, staining reactions were combined with analysis by swelling methods and with chemical investigation of the following material: pine wood infected by *Merulius lacrymans*, and wheat and barley haulms attacked by *Ophiobolus graminis* and *Fusarium culmorum*, respectively. The air-dry diseased pine wood was treated with 0·2 per cent. chlorine water, from which it was freed after 12 hours and transferred to 1 per cent. ammonia. After six repetitions of this process the residue consisted of a white, fibrous substance which did not swell in cuprammonium. Infected wood in varying stages of disintegration stained red on treatment with dilute phloroglucin-hydrochloric acid, a faint reaction being discernible even in the most advanced phase. The chlorzinc-iodine reaction decreases progressively with increasing disintegration and eventually none is given. The hydrogen-ion concentration of an aqueous suspension of the substances, electrometrically determined, was P_H 4·30. The results of this experiment, taken in conjunction with those of the writer's earlier studies, are considered to indicate that the entire cell membrane of the wood attacked by fungi, represented in this case by *M. lacrymans*, undergoes a change. The use of the terms 'lignin-consumers' and 'cellulose-consumers' [*R.A.M.*, x, p. 148] is regarded as inexact, since all the components

of the cell wall are involved and even the residue shows modification as compared with the original material.

The microchemical examination of wheat plants attacked by *O. graminis* showed that the protuberances described by Fellows as 'lignitubers' [ibid., viii, p. 370] are really formed by a membrane, corresponding to the tertiary lamella in normal plants, which separates the carbohydrates of the secondary lamella from the plasma. When sections of diseased material were treated alternately with 0·2 per cent. chlorine water and dilute ammonia, the protuberances persisted, instead of disappearing as would have been the case were they composed of lignin. The fibres failed to swell under the action of cuprammonium, indicating that here, as in the case of dry rot, a change occurs in their consistency. The phloroglucin reaction is positive even in diseased plants, though becoming fainter in the advanced stages, when it is replaced by the appearance of dark-coloured products evidently resulting from lignin disintegration. The chlorzinc-iodine reaction was uniformly positive. *O. graminis* would appear from these investigations to be concerned with the cell membrane only incidentally while penetrating to the cell contents.

A similar relationship was observed in the case of *F. culmorum* [ibid., ix, p. 667], which merely caused incidental changes in the cell wall in the course of penetration. Both phloroglucin and chlorzinc-iodine reactions were positive. The fibres of diseased haulms did not swell in chlorine water and ammonia but simply dissolved. The microchemical effects of the two foot-rot organisms are thus very similar on mature plants. Neither wheat nor barley undergoes extensive modifications in slight attacks. It is considered probable that the greater susceptibility of young plants to these parasites is due to the part played by certain enzymes in the decomposition of the polymerous carbohydrates, the success of which is dependent on coincidence between the development of the fungus and that of the host.

SMITH (K. M.). **Studies on Potato virus diseases. IX. Some further experiments on the insect transmission of Potato leaf roll.**—*Ann. of Appl. Biol.*, xviii, 2, pp. 141–157, 1 pl., 5 figs., 1931.

In this further paper on virus diseases of the potato [*R.A.M.*, x, p. 614] the author describes experiments during three years at Cambridge on the transmission of potato leaf roll by the aphid *Myzus persicae* [see above, p. 809] for the special purpose of investigating the relationship between the insect vector and the virus. The results indicated that healthy (non-infective) individuals require at least six hours' feeding on leaf roll potato plants to pick up the virus, and that apparently, under the conditions of the tests, a minimum of approximately 54 hours must elapse from the beginning of the experiment for the healthy insect to become infective. Once infective, it is capable of transmitting the leaf roll virus to a healthy potato plant after two hours' feeding. Attempts to transmit the disease by needle inoculations with the body juices of infective aphids invariably gave negative results. It was further shown that virus-bearing *M. persicae* are capable

of infecting consecutively from 6 to 10 healthy potato plants without again having access to a source of leaf roll infection, although occasionally plants within the series failed to contract the disease. The leaf roll virus occurring in American potato varieties, as exemplified by 'Green Mountain', was as easily transmitted by *M. persicae* as that in the British Isles. Under the conditions of the present work, the incubation of the leaf roll virus in the potato plant, i.e. from the time of infection to the appearance of the first symptoms, averaged about 14 days, the shortest period of incubation being in the series in which the aphids remained seven days on the source of infection.

A brief description is also given of further transmission tests with five other species of aphids, two of which, *M. pseudosolani* and *M. circumflexus* [ibid., ix, p. 738], were shown to be capable of transmitting the leaf roll virus, while the other three (*Macrosiphum gei, Aphis rhamni,* and *A. gossypii*) consistently gave negative results.

ELZE (D. L.). **Die Übertragbarkeit mit dem Samen von Aukuba-Mosaik sowie Blattroll (Phloemnekrose) der Kartoffel.** [The transmissibility by the seed of aucuba mosaic and leaf roll (phloem necrosis) of the Potato.]—*Phytopath. Zeitschr.*, iii, 4, pp. 449–457, 7 figs., 1931.

The writer's views on the nature of virus diseases are recapitulated [*R.A.M.*, x, p. 747] and experiments are described on the transmissibility of leaf roll and aucuba mosaic of the potato by means of the true seed.

In 1928 seed was collected (1) from an aucuba mosaic-diseased plant grown in an insect-free greenhouse; (2) from an aucuba mosaic plant of the same origin as (1) grown in the field and so exposed to infection; (3) from plants infected in the field during the current year by primary leaf roll; and (4) from healthy plants of the same origin grown in proximity to the three above-mentioned lots. All the plants were of the Paul Krüger [President] variety. The seed was disinfected with 2 per cent. corrosive sublimate and sown in the following summer in an insect-free greenhouse. Some of the seedlings from all the lots except (4) showed the typical symptoms of virus infection. In the same year 8 seedlings of lot (1) were grafted on to healthy plants of Erstling [Midlothian Early]; 2 of lot (2) on Midlothian Early and 1 on President; 2 of lot (3) on Midlothian Early and 4 on President; and 3 of lot (4) on President. In 1930 one tuber of each harvested plant was planted out in the greenhouse under insect-free conditions.

Of the eight grafts in lot (1) four were distinctly affected with aucuba mosaic in 1930; in lot (2) all three grafts were healthy; in lot (3) two out of the six (one of each variety) showed leaf roll; and in lot (4) all were healthy. None of these plants had shown any pathological symptoms in 1929. It is apparent, therefore, that the virus both of aucuba mosaic and leaf roll is transmissible by the seed. It was observed, however, that not all seedlings of abnormal appearance were capable of transmitting infection and further that two of the leaf roll seedlings which did transmit infection themselves showed no symptoms, and therefore belong

to the category of 'carriers', a phenomenon hitherto unknown in leaf roll.

VERPLANCKE (G.). **Étude histologique comparée de tubercules sains, allongés et normaux et de tubercules atteints de 'spindle tuber'.** [Comparative histological study of healthy, elongated Potato tubers, normal Potato tubers, and tubers affected with spindle tuber.]—*Bull. Soc. Roy. Bot. de Belg.*, lxiii (Sér. II, xiii), 2, pp. 138–148, 1 pl., 1931.

An account is given of a morphological examination made of elongated but otherwise healthy, normal healthy, and spindle tuber [*R.A.M.*, ix, p. 332; x, p. 50] Green Mountain potatoes, in which measurements were made of the cell dimensions in the tissues of the crown or apex. The length to breadth ratios of the cells in the various parts of the three groups of tubers were then worked out. The results [which are tabulated in detail and discussed] showed that while the cell dimensions in the elongated, healthy tubers were not always the same as those in the normal, healthy tubers, the length to breadth ratios were approximately identical in both. This ratio, however, was much smaller in the two healthy groups than in the spindle tuber potatoes, from which the author concludes that the elongation seen in potato tubers affected with this virus disease is a specific result of the action of the virus.

KÖHLER (E.). **Über die verschiedenen Typen der Krebsresistenz und Krebsempfänglichkeit bei den Kartoffelsorten.** [On the different types of wart-resistance and wart-susceptibility among Potato varieties.]—*Der Züchter*, iii, 7, pp. 249–252, 1 fig., 1931.

Among the standard potato varieties officially recognized as immune from wart disease [*Synchytrium endobioticum*] in Germany are several belonging to infection grade III (characterized by a relatively large number of 'full infections') [*R.A.M.*, ix, p. 802; x, p. 544], while a few are even found in grade IV, the highest infection grade, in which practically all the sporangia of the fungus reach maturity. Amongst the seventeen representative of the former group are Berggeist, Cellini, Goldappel, Max Delbrück, Kuckuck, Palma, and Preussen, and of the latter, Blaue Gelbfleischige and Roland I. The explanation of this apparent discrepancy lies in the low degree of reaction (as distinct from infection) of the varieties in question, which do not form the excrescences typical of susceptibility even in the case of virulent infection.

REDDICK (D.). **A first step in the solution of a Potato problem.** —*Amer. Potato Journ.*, viii, 7, pp. 169–174, 1931.

The writer gives some particulars of the search made by himself and his collaborators for wild hybrids of *Solanum tuberosum* in the Mexican Highlands from August to December 1930. A collection made in the State of Morelos showed marked symptoms of blight (*Phytophthora infestans*), the diagnosis being confirmed by microscopic examination. The affected species has not yet been identified the tubers were attached to stolons about 1 m. long.

This record establishes the occurrence of late blight on wild potatoes in Mexico and helps to explain the development of immunity by *S. demissum* [*R.A.M.*, x, p. 335].

CLAYTON (E. E.). **Some observations on Long Island's Potato spray problem.**—*Amer. Potato Journ.*, viii, 7, pp. 177–179, 1931.

The writer discusses in popular terms some of the problems connected with spraying against potato blight [*Phytophthora infestans*] on Long Island, New York. In 1922 and 1928 gains of 75 to 100 bushels per acre resulted from the application of Bordeaux mixture. The situation is complicated, however, in certain seasons (as in 1930) by the simultaneous development of blight and aphids, the relative importance of which can only be determined at a much later date. In such cases the large quantities of Bordeaux necessary to control the fungus are liable to kill certain organisms which have proved very valuable in destroying aphids. Brief suggestions are made for obviating these difficulties by a study of the times and rates at which the fungicide can be most effectively applied throughout the season.

ENDÔ (S.). **On the influence of the temperature upon the development of Hypochnus.**—*Ann. Phytopath. Soc. Japan*, ii, pp. 280–283, 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 4, pp. (89)–(90), 1931.]

The temperature relations of the Japanese and Philippine strains of *Hypochnus* [*Corticium*] *susakii* were studied in connexion with the infection of rice plants [*R.A.M.*, viii, p. 263; cf. also vii, p. 296]. By exposing plants artificially inoculated with the sclerotia of these organisms to temperatures ranging from 24° to 36° C. it was found that infection occurs most rapidly at 32° (18 to 24 hours); at 28° an incubation period exceeding 24 hours was required, while at 24° and 36° no infection took place even after this length of time. Counts of the number of disease spots each day after infection showed that the infection process is most intense at 28° and 32°, especially the latter. The most profuse development of hyphae from the sclerotia was observed to occur between 28° and 32°.

United States Department of Agriculture. Plant quarantine and control administration. Service and regulatory announcements, October–December, 1930.—pp. 134–198, 1931.

Summaries are given (pp. 179–190) of the plant quarantine restrictions current in South Africa, Australia, France, and Germany.

United States Department of Agriculture. Plant quarantine and control administration. Service and regulatory announcements, January–March, 1931.—pp. 1–37, 1931.

Among other items of phytopathological interest, summaries are given of the quarantine restrictions governing the importation of plants into the Netherlands, Denmark, and New Zealand.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iii, 3, pp. 126–130, 136–137, 150–154, 1931.

GERMANY. The provisions of the regulations dated 25th March 1931, and effective as from 1st May 1931, governing all dealings with poisonous substances used in pest control, are cited.

DENMARK. The provisions of the regulations dated 28th February 1931, and effective as from 1st Mafch 1931, governing commerce in poisonous substances used in pest control (including mercury-containing fungicides) are cited.

SWEDEN. A Royal Decree of 13th March 1931, effective as from 1st April 1931, prohibits the importation into Sweden of living plants of the elm family (Ulmaceae) [presumably with a view to preventing the introduction of *Graphium ulmi*]. Any such plants reaching the country will be detained by the customs authorities and either re-exported or, if no claim to this effect be made within 30 days, destroyed at the owner's cost.

SWITZERLAND. The current regulations governing the importation into Switzerland of plants and seeds are cited. Duly authenticated health certificates must accompany consignments of potatoes from the following countries known to be infested by wart disease [*Synchytrium endobioticum*]: Belgium, Germany (including the Saar region), Denmark, Great Britain, Holland, Austria, Poland, Czecho-Slovakia, Danzig Free State, and the French departments of Upper and Lower Rhine.

Legislative and administrative measures. Germany (Saxony).—*Internat. Bull. of Plant Protect.*, v, 7, pp. 121–122, 1931.

An Order of the Ministry of National Economy, Saxony, dated 12th March 1931, provides for measures to be taken by the communes to control diseases and pests of fruit trees and asparagus. The general and uniform control of asparagus rust (*Puccinia asparagi*) [*R.A.M.*, x, p. 288] is provided for by the exclusive cultivation of varieties of recognized resistance and by spraying with Bordeaux mixture if necessary. The sanitary measures recommended for this crop include the cutting and burning of the stems in the field before the end of October every year, seed selection, proper spacing of the plants, and adequate tillage and fertilizing.

Legislative and administrative measures. Mexico.—*Internat. Bull. of Plant Protect.*, v, 7, pp. 122–123, 1931.

In order to prevent the introduction into Mexico of flag smut (*Urocystis tritici*) and take-all (*Ophiobolus graminis*) of wheat, as well as of other serious diseases not yet present in the Republic, a 'Cuarantena Exterior absoluta' is proclaimed, modifying the 'Cuarantena Exterior número 8' [*R.A.M.*, viii, p. 272] and effective as from 6th March 1931, whereby the importation of all species and varieties of wheat is prohibited except under strict official safeguards for purposes of study or scientific research.

INDEX OF AUTHORS

GENERAL INDEX